Studies in Euphorbiaceae A.L.Juss. *sens. lat.* 5.

A revision of *Pseudanthus* Sieber ex Spreng. and *Stachystemon* Planch. (Oldfieldioideae Köhler & Webster, Caletieae Müll.Arg.)

David A. Halford and Rodney J.F. Henderson

Summary

Halford, D.A. and Henderson, R.J.F. (2003). Studies in Euphorbiaceae A.L.Juss. *sens. lat.* 5. A revision of *Pseudanthus* Sieber ex Spreng. and *Stachystemon* Planch. (Oldfieldioideae Köhler & Webster, Caletieae Müll.Arg.). *Austrobaileya*, 6(3): 497–532. A systematic study of *Pseudanthus* Sieber ex Spreng. and *Stachystemon* Planch. is presented. Nine species are recognised in *Pseudanthus*, of which three are newly described here, while nine species are recognised in *Stachystemon*, three of which are also described here as new. These six new species are *Pseudanthus ballingalliae* Halford & R.J.F.Hend., *P. ligulatus* Halford & R.J.F.Hend., *P. pauciflorus* Halford & R.J.F.Hend., *Stachystemon intricatus* Halford & R.J.F.Hend., *S. mucronatus* Halford & R.J.F.Hend. and *S. vinosus* Halford & R.J.F.Hend. The new combinations *Pseudanthus orbicularis* (Müll.Arg.) Halford & R.J.F.Hend., based on *Caletia divaricatissima* var. *orbicularis* Müll.Arg., *Stachystemon nematophorus* (F.Muell.) Halford & R.J.F.Hend., based on *Pseudanthus nematophorus* F.Muell. and *S. virgatus* (Klotzsch) Halford & R.J.F.Hend., based on *Chrysostemon virgatus* Klotzsch, are made. New species are illustrated while all species are described and their distributional range mapped, and notes on their distribution, habitat and phenology are given. Lectotypes are chosen for *Pseudanthus orientalis* F.Muell., *P. ovalifolius* F.Muell. and *P. polyandrus* F.Muell., as well as *Stachystemon vermicularis* Planch. *Pseudanthus pimeleoides* Sieber ex Spreng. is neotypified. All known synonyms are listed here including phrase names that have been used to identify the taxa prior to formal publication of their names. A key to identify the species is also provided.

Key words: *Euphorbiaceae, Pseudanthus, Stachystemon, Australian flora, taxonomy, nomenclature*

David A. Halford and Rodney J.F. Henderson, Queensland Herbarium, Environmental Protection Agency, Brisbane Botanic Gardens Mt Coot-tha, Mt Coot-tha Road, Toowong, Queensland 4066, Australia.

Introduction

This paper presents a taxonomic revision of the genera *Pseudanthus* Sieber ex Spreng. and *Stachystemon* Planch. Nine species are recognised in each genus. These two genera are very similar anatomically (Levin & Simpson 1994) and are evidently very closely related. They have consistently been linked in previous classifications recognising subdivisions within the Euphorbiaceae (Müller 1866, Bentham 1880, Grüning 1913, Pax & Hoffmann 1931).

The most recent classification of Euphorbiaceae places *Pseudanthus* and *Stachystemon* in subtribe Pseudanthinae Müll.Arg., in tribe Caletieae Müll.Arg. in subfamily Oldfieldioideae Köhler & Webster (Webster 1994, Levin & Simpson 1994). The other genera included in this subtribe are *Kairothamnus* Airy Shaw, *Scagea* McPherson, *Micrantheum* Desf. and *Neoroepera* Müll.Arg. *Kairothamnus* (monotypic) and *Scagea* (with two species) are endemic genera of New Guinea and New Caledonia respectively, while *Micrantheum* (with four species) and *Neoroepera* (with two species) are small endemic Australian genera. *Pseudanthus* and *Stachystemon* differ from all other genera of the Pseudanthinae in having conspicuous, decurrent stipules and fruits that are 1-seeded. The four Australian genera of the Pseudanthinae are similar in characters of leaf architecture, leaf anatomy and wood structure (Hayden 1994). However, *Micrantheum* differs from *Pseudanthus* and *Stachystemon* in having what is interpreted as large foliose stipules (Grüning 1913, Levin & Simpson 1994) and pollen grains with long, more or less exinous spines (Webster 1994), while *Neoroepera* differs from them in having cotyledons several times broader than the radicle, male flowers with many

Accepted for publication 11 February 2003

discrete glands present between the tepals and stamens, styles with the distal portion expanded and flattened into a large stigmatic zone, and fruit that dehisce leaving a persistent, stout columella.

Traditionally the main distinction between *Pseudanthus* and *Stachystemon* has been the nature of the androecium and the structure variously interpreted as a central disc or a pistillode in male flowers. *Pseudanthus* was described by Sprengel (1827) who included in it a single species, *P. pimeleoides,* based on material collected by Sieber from the Sydney region of eastern Australia. *Pseudanthus pimeleoides* has male flowers with 6 stamens in 2 whorls that are closely clustered around a small central disc. In 1845, Planchon described the genus *Stachystemon* to contain a single species, *S. vermicularis* (as *S. vermiculare*), based on material collected by James Drummond in south-western Western Australia. Planchon considered *Stachystemon* to be similar to *Pseudanthus* in habit, stipules, calyx morphology and ovule arrangement, but differing strikingly from that in androecium morphology. *Stachystemon vermicularis* has male flowers with numerous ± sessile anthers borne on an elongated cylindrical column and lacking any central disc.

In the most recent account of *Pseudanthus* and *Stachystemon* as a whole, Grüning (1913) recognised seven species in *Pseudanthus* and three species in *Stachystemon*. He distinguished the two genera on androecium morphology. He then proceeded to divide *Pseudanthus* into three sections based on stamen number and length of the tepals in male flowers. Thus, *P. pimeleoides* with 6 stamens and linear tepals about 1 cm long was placed by itself in one group he called *P.* sect. *Eupseudanthus* (= *P.* sect. *Pseudanthus*). *Pseudanthus orientalis, P. ovalifolius, P. divaricatissimus* and *P. micranthus*, with 3 to 6 stamens and ovate tepals 1–2 mm long, formed the second group he called *P.* sect. *Microcaletia*, while *P. virgatus* and *P. nematophorus*, with 9–18 stamens, formed the third group, *P.* sect. *Chrysostemon*. Grüning commented in his discussion of *Stachystemon* that the genus could well be united with the sect. *Chrysostemon* of the genus *Pseudanthus*.

Recently, Radcliffe-Smith (1993) argued that there was a continuum of variation with regard to the androecium and that the differences between *Pseudanthus* and *Stachystemon* were insufficient to warrant recognition of two genera. He tabulated the eleven species then known in the two genera and listed the androecium and disc character states for each species. He recorded *P. virgatus* and *P. nematophorus* as having a central disc in the male flowers and *S. polyandrus* as having a vestigial central disc. He also listed *P. pimeleoides* as having its staminal filaments partly fused to the central disc.

In undertaking the present revision, we have reassessed the morphological characters of the species previously consigned to *Pseudanthus* and *Stachystemon*. We have found that *P. virgatus, P. nematophorus* and *S. polyandrus* do not have a central disc in the male flower, and that although the inner staminal filiaments of *P. pimeleoides* are appressed to the central disc they are not fused to that central disc. We have thus concluded that the androecium structure and the presence or absence of a central disc in male flowers are still useful diagnostic characters to distinguish between two groups of species. Following transfer of *P. virgatus* and *P. nematophorus* (i.e. members of *P.* sect. *Chrysostemon*) from *Pseudanthus* to *Stachystemon*, these groups become distinctive morphological and biogeographic entities that are, we believe, worthy of recognition at the generic rank. Consequently, it is our contention that these taxa should be maintained as distinct genera named *Pseudanthus* and *Stachystemon* and distinguished as follows.

Key to *Pseudanthus* and *Stachystemon*

Male flowers with a central disc present and stamens 3–6, ± free, on a ± flat receptacle ..... **Pseudanthus**

Male flowers without a central disc, with stamens > 7, variously fused or on a raised receptacle ..... **Stachystemon**

Materials and methods

This revision is based on an assessment of morphological characters of about 550 dried herbarium collections, and collections and field studies undertaken by the second author from 1988 to 1992. Herbarium collections from herbaria AD, BRI, CANB, HO, MEL, NE, NSW and PERTH were studied and annotated, and selected material from B, K and LD was also seen. Acronyms used here and elsewhere to indicate herbaria holding particular specimens are those listed by Holmgren *et al.* (1990). All specimens cited have been examined by one or both of the authors, unless indicated otherwise by (*n.v.*).

The species treated in the present paper are listed alphabetically. Descriptions of colour of vegetative and floral parts are either from the herbarium labels or from photographs taken by the second author during field studies. Measurements listed are based upon the total variation observed in the herbarium specimens examined. Information on plant size, flowering and fruiting times, and habitat of occurrence was obtained from herbarium labels. All measurements were made either on fresh material, dried material, material preserved in 70% ethanol, or dried material reconstituted by placing in boiling water for a few minutes. The term 'obloid' is defined as a 3-dimensional shape; a parallelipiped with rounded corners and edges. The morphological data for this revision were recorded using the DELTA system (Dallwitz *et al.* 1993). The distribution maps were produced with MapInfo Version 3 and are based on herbarium specimen locality data.

Taxonomy of *Pseudanthus*

Pseudanthus Sieber ex Spreng., Syst. veg. 16th edn, 4(2), curae posteriores: 22 (1827); *Pseudanthus* Sieber ex Spreng. sect. *Pseudanthus*, Müll.Arg., Linnaea 34: 55 (1865). **Type:** *Pseudanthus pimeleoides* Sieber ex Spreng.

Caletia sect. *Microcaletia* Müll.Arg., Linnaea 34: 55 (1865); *Pseudanthus* sect. *Microcaletia* (Müll.Arg.) Kuntze in Post & Kuntze, Lex. Gen. Phan. 463 (1903). **Type:** not designated.

Pseudanthus sect. *Eupseudanthus* Müll.Arg., Linnaea 34: 55 (1865), *nom. inval.*

***Derivation of name*:** Named from Greek *pseudos* (false) and *anthos* (flower), in reference to the small flower-clusters at the apex of branchlets in *P. pimeleoides* appearing to be a single conspicuous flower (Baines 1981).

Monoecious shrubs. Stems erect, ascending or decumbent, rarely prostrate, much branched; branchlets ± terete, reddish brown coloured, glabrous or rarely pubescent, longitudinally ridged by decurrence of margins of stipules along internodes. Leaves stipulate, petiolate, alternate, opposite or decussate, simple; stipules persistent, with margins entire or toothed, glabrous or fimbriate; laminae flat or concavo-convex, entire, usually conspicuously thickened along margins. Flowers solitary (or rarely 2 or 3) in upper leaf axils, bracteate; distal branchlet internodes often contracted to produce terminal flower clusters with subtending leaves reduced and bract-like. Male flowers pedicellate; tepals 6(or rarely 5), subequal, in 2 whorls, with each whorl imbricate in bud but spreading or erect at anthesis; receptacle ± flat; stamens 6(or rarely 3–5), in 2 whorls with those of the outer whorl opposite outer tepals, and those of the inner whorl opposite inner tepals; filaments free, erect, stout, those of outer whorl stamens shorter than those of inner whorl stamens; anthers 2-celled, free, dorsifixed; cells obloid, dehiscing by longitudinal slits; disc present, generally 3-lobed, fleshy. Female flowers sessile or rarely shortly pedicellate; tepals 6(or rarely 4 or 5), persistent, subequal, in 2 whorls with each whorl imbricate in bud, later appressed to ovary (and fruit); disc absent; ovary 3(rarely 2)-celled with 2(rarely 1) ovules in each locule; styles 3(rarely 2), stout, shortly connate or ± free, simple, persistent, erect and spreading or recurving distally, canaliculate on adaxial surface. Fruits capsular, ovoid to cylindrical-ellipsoid, 1-seeded by abortion, splitting at maturity into 3 bivalved segments. Seeds globose to ovoid or obloid to cylindrical, smooth, with exostomal pit obscure to well developed, carunculate; endosperm copious; cotyledons a little broader than the radicle.

A genus of 9 species endemic in eastern Australia.

Key to species of *Pseudanthus*

1. Tepals of male flowers ≥5 mm long 2
   Tepals of male flowers < 5 mm long 3

2. Tepals of male flowers acute to obtuse with red-brown apiculum (visible in dried state) . . . . . **3. P. ligulatus**
   Tepals of male flowers acute to obtuse without red-brown apiculum . . . . . **9. P. pimeleoides**

3. Branchlets hairy; male flowers with (2 or) 3 stamens . . . . . **4. P. micranthus**
   Branchlets glabrous; male flowers with 6 stamens 4

4. Locules uniovulate . . . . . **7. P. ovalifolius**
   Locules biovulate 5

5. Tepals of male flowers > 2 mm long . . . . . **8. P. pauciflorus**
   Tepals of male flowers ≤ 2 mm long 6

6. Leaves < twice as long as broad . . . . . **5. P. orbicularis**
   Leaves ≥ twice as long as broad 7

7. Stipules entire; margins of leaf laminae thin . . . . . **1. P. ballingalliae**
   Stipules irregularly toothed or fimbriate; margins of leaf laminae conspicuously thickened 8

8. Stipules fimbriate; leaf laminae narrowly elliptic to elliptic or ovate, 2 to 3 times as long as broad, 3–5.5 mm long, 1.3–2.1 mm wide . . . . . **2. P. divaricatissimus**
   Stipules irregularly toothed; leaf laminae linear, narrowly oblong to oblong or oblanceolate, 3 to 9 times as long as broad, 3.5–13 mm long 0.7–1.7 mm wide . . . . . **6. P. orientalis**

The species are here arranged alphabetically.

1. Pseudanthus ballingalliae Halford & R.J.F.Hend. **sp. nov.** affinis *P. divaricatissimo* (Müll.Arg.) Benth. sed plantis statura diffusa et altiore (frutex diffusus usque ad 1.5 m altus non compactus ad 15 cm altus), foliorum lamina oblonga vel oblongo-elliptica non ovata vel elliptica, marginibus non conspicue incrassatis, floribus masculinis pedicellis brevioribus (ad 0.5 mm non 0.7–1.2 mm longis) et staminibus 3 ad 5 non 6, floribus femineis tepalis omnino glabris non pubescentibus distaliter in pagina adaxiali differt. **Typus:** Queensland. Leichhardt District: Robinson Gorge, Expedition NP, 29 October 1999, *D.A. Halford* Q3835 (holo: BRI, iso: CANB, K, L, MEL, MO, NSW, distribuendi).

Pseudanthus sp. (Salvator Rosa NP M.E.Ballingall MEB450); Forster & Halford (2002, p. 73).

Diffuse shrub to 1.5 m high; stems ascending to erect, freely branching; branchlets glabrous. Leaves decussate rarely subopposite; stipules triangular, 0.2–0.5 mm long, red-brown, acute with a dark brown glandular tip, and with margins entire; decurrent margins glabrous or minutely papillose; petioles 0.4–0.6 mm long, smooth; laminae flat or slightly concavo-convex, oblong to narrowly oblong or narrowly oblong-elliptic, 2.8–7(–9) mm long, 1–1.8 mm wide, length/width ratio 2–5:1, glabrous or rarely with minute scabrid hairs on margins; midrib obscure adaxially, slightly raised abaxially; tip straight or slightly recurved, rounded to obtuse, with a minute red-brown apiculum; margins flat, not obviously thickened. Flowers solitary in

axils of upper leaves though appearing to be in terminal clusters; bracts narrowly triangular or ovate, 0.2–0.7 mm long, glabrous except for fimbriate margins. Male flowers on pedicels c. 0.5 mm long; tepals 5 or 6, convex-concave, narrowly obovate or suborbicular, 0.9–1 mm long, 0.6–0.9 mm wide, yellow coloured, spreading; apex rounded; margins entire; receptacle glabrous; stamens 3–5, with filaments entire, free, 0.2–0.3 mm long, and anthers 0.3–0.4 mm long; disc irregularly lobed. Female flowers sessile; tepals 6, ovate, 1.2–1.8 mm long, 0.7–1 mm wide, green coloured, slightly keeled, glabrous; apex rounded; margins erose; receptacle glabrous. Ovaries trigonal-globose, 0.6–1 mm across, glabrous; locules 3, biovulate; styles 0.7–1 mm long, erect and spreading distally. Fruits sessile or shortly pedicellate with pedicel up to 0.2 mm long; persistent tepals ≤half the length of the capsule; capsule narrowly ovoid or narrowly cylindric-ellipsoid, 4–5.3 mm long, 2–2.7 mm across, smooth or tuberculate along ridges, glabrous, green coloured turning brown with age. Seeds ± obloid, c. 3.5 mm long, c. 1.6 mm wide, c. 1.8 mm across; testa smooth, dull brown; exostome pit well developed; caruncle squat-conical, c. 0.7 mm long, c. 1 mm wide. **Fig. 1.**

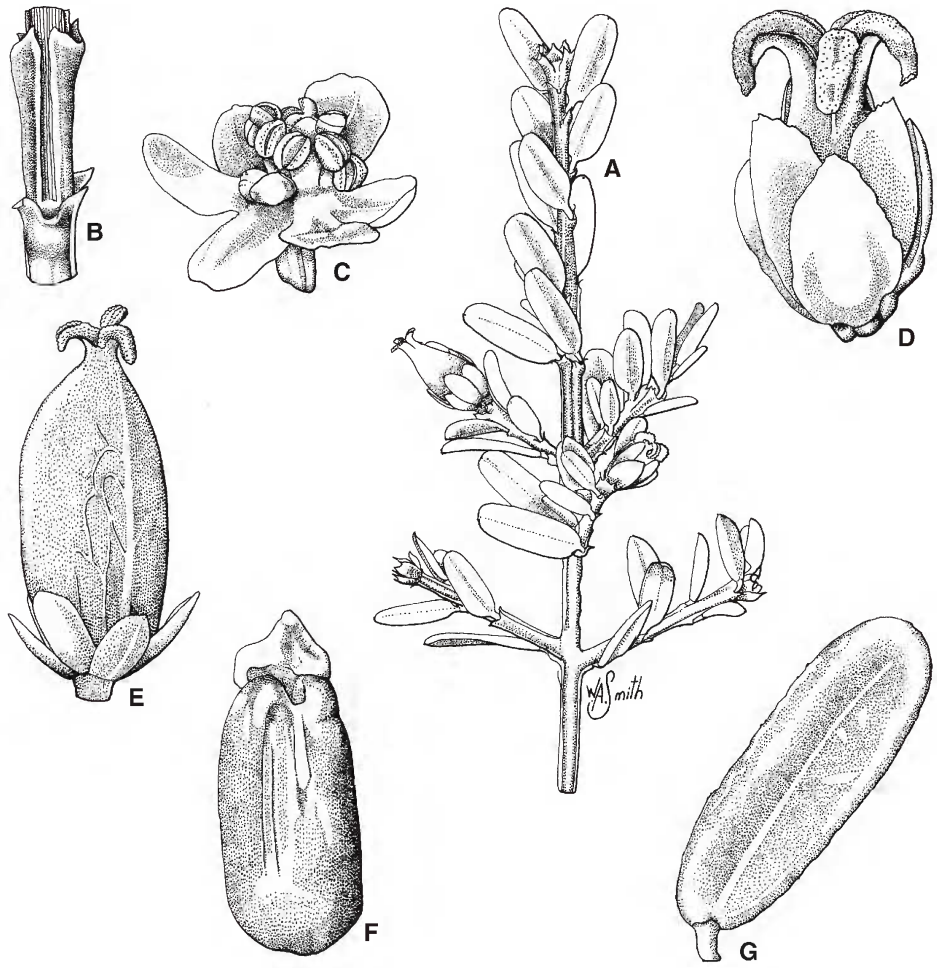


Fig. 1. ***Pseudanthus ballingalliae.*** A. branchlet with fruit × 4. B. section of branchlet with leaves removed showing stipules with decurrent margin × 12. C. male flower from side × 18. D. female flower × 18. E. fruit with persistent tepals × 8. F. seed × 12. G. leaf ×12. A-G from *Halford* Q3835 (BRI). Del. W. Smith.

***Additional specimens*: Queensland.** LEICHHARDT DISTRICT: Sentinel Mt, Salvator Rosa Section, Carnarvon NP, Oct 1981, *Ballingall* MEB450 & *Cockburn* (BRI); Robinson Gorge, Expedition NP, Sep 1995, *Forster* PIF17699 & *Figg* (BRI); *ditto*, Sep 1995, *Forster* PIF17751 & *Figg* (BRI); Spring Creek, Expedition NP, Sep 2000, *Forster* PIF26138 & *Booth* (BRI).

***Distribution and habitat*:** *Pseudanthus ballingalliae* is endemic in central Queensland, occurring in the Carnarvon and Expedition National Parks. It is recorded as growing in open eucalypt forest or woodland communities on shallow sandy soils on steep slopes and in sandstone gorges. **Map 1.**

***Phenology*:** Flowers and fruits have been collected in September and October.

***Affinities*:** *Pseudanthus ballingalliae* is similar to *P. divaricatissimus* but differs from that in its taller, diffuse habit (shrubs up to 1.5 m high as compared with compact shrubs to 15 cm high), oblong or oblong elliptic as compared with ovate or elliptic leaf laminae, with margins not prominently thickened, male flowers on pedicels up to 0.5 as compared with 0.7–1.2 mm long and with 3 to 5 rather than 6 stamens, and female flowers with wholly glabrous tepals.

***Etymology*:** The species is named in honour of Ms M.E. (Betty) Ballingall (1920-1998) who made many useful botanical collections in southern Queensland and Central Australia now incorporated into various herbaria, and apparently the first person to have collected this species.

2. Pseudanthus divaricatissimus (Müll.Arg.) Benth., Fl. Austral. 6: 60 (1873); *Pseudanthus divaricatissimus* (Müll.Arg.) Benth. var. *divaricatissimus*, Benth., Fl. Austral. 6: 60 (1873); *Caletia divaricatissima* Müll.Arg., Linnaea 32: 79 (1863); *Caletia divaricatissima* Müll.Arg. var. *divaricatissima*, Müll.Arg., Flora 47(31): 486 (1864). **Type:** New South Wales. Blue Mountains, in 1818, *A. Cunningham* (holo: G-DC *n.v.*, microfiche IDC 800–73. 2453: III, 5).

Caletia divaricatissima var. *genuina* Müll.Arg., Flora 47(31): 486 (1864), *nom. inval.*

Pseudanthus divaricatissimus var. *genuinus* Grüning in A.Engler, Pflanzenr. H.58: 30 (1913), *nom. inval.*

***Illustration*:** G. Grüning (1913: p. 29, fig. 6A–B).

Compact shrub to 15 cm high; stems ascending to decumbent or prostrate, freely branching; branchlets glabrous. Leaves alternate or decussate; stipules triangular to broadly triangular, 0.5–0.6 mm long, red-brown, acuminate, with margins fimbriate; decurrent margins glabrous or minutely papillose; petioles 0.3–0.5 mm long, smooth; laminae slightly concavo-convex, narrowly elliptic to elliptic or ovate, 3–5.5 mm long, 1.3–2.1 mm wide, length/width ratio 2–3:1, smooth, glabrous except for minute scabrid hairs on margins; midrib obscure adaxially, slightly raised abaxially; tip recurved, rounded to obtuse or acute with a minute white-coloured apiculum; margins flat or slightly recurved, conspicuously thickened and white coloured. Flowers solitary in axils of upper leaves, sometimes with subtending leaf much reduced; bracts ovate, 0.4–0.5 mm long, pubescent on margin and on the adaxial surface. Male flowers on pedicels 0.7–1.2 mm long; tepals 6, ± flat, ovate, ovate-elliptic or obovate, 0.8–1.5 mm long, 0.5–0.8 mm wide, pale red, spreading; apex rounded or obtuse; margins entire; receptacle glabrous; stamens 6, with filaments entire, free, 0.2–0.8 mm long, and anthers 0.3–0.4 mm long, smooth; disc 3-lobed with each lobe notched at tip. Female flowers sessile or pedicellate with pedicels up to 1 mm long; tepals 6, ovate or broadly oblong, 1.2–1.6 mm long, 0.6–1 mm wide, pale red coloured, keeled, pubescent on adaxial surface distally, glabrous on abaxial surface; apex acute to obtuse or rounded; margins minutely fimbriate; receptacle glabrous. Ovaries trigonal-globose, 0.4–0.6 mm across, glabrous; locules 3, biovulate; styles 0.5–0.9 mm long, erect and recurved distally. Fruits sessile or shortly pedicellate with pedicel 0.4–0.5 mm long; persistent tepals ≤half the length of the capsule; capsule ovoid, 4–4.5 mm long, 2.4–2.8 mm across, smooth, glabrous, mottled green and red. Seeds broadly ovoid or subglobose, 2.4–2.8 mm long, 2.1–2.4 mm across; testa smooth or slightly rugose, subglossy dark brown; exostome pit well developed; caruncle squat-conical, c. 0.6 mm long, c. 1.2 mm wide.

***Selected specimens (from c. 45 examined)*: New South Wales.** North Obelisk, 2 km W of Urbenville, Oct 1990, *Bean* 2506 (BRI); near northern end of Narrow Neck Peninsula, Nov 1983, *Benson* 1325 & *Keith* (NSW); Goonoo State Forest, 2 km N of Frost

Road, Sep 1988, *Briggs* 2386 (MEL, NSW); Wentworth Falls, Blue Mountains, Oct 1965, *Burgess* s.n. (CANB [CBG015349], NSW); Sublime Point, Leura, Dec 1962, *Constable* 4123 (NSW); Mount Blackheath, c. 3 miles [c. 5 km] W of Blackheath, Oct 1959, *Constable* s.n. (AD, NSW [NSW48924]); Kings Tableland, 3 miles [c. 4.8 km] S of Wentworth Falls, Oct 1960, *Constable* s.n. (NSW [NSW55742]); near Newnes junction, 5 miles [c. 8 km] E of Lithgow, Feb 1967, *Coveny* s.n. [NSW130514] (NSW); 3.3 km E of Mt Coricudgy, Oct 1976, *Crisp* 2237 *et al.* (AD, CANB); Blue Mountains, 2.5 km NNE of Clarence sawmill, Oct 1994, *Davies* 1766 & *Corsini* (CANB, MEL); Morton NP, Northern Budawang Range, NW of Crooked Falls, Oct 1985, *Gilmour* 5271 (CANB); Newnes Junction, Sep 1914, *Hamilton* s.n. (NSW); Wentworth Falls, Apr 1914, *Hamilton* s.n. (NSW); Evans Lookout, Blue Mountains NP, Oct 1990, *Henderson* & *Turpin* H3421 (BRI); Goonoo State Forest, c. 15 km SW of Mendooran on road to Dubbo, Sep 1989, *Henderson* & *Turpin* H3243 (BRI, NSW); Bald Trig, off Clarence-Glowworm Tunnels road, Feb 1986, *Hind* 4477 (NSW); Kings Tableland, S of Wentworth Falls, Aug 1952, *Melville* 649 & *Johnson* (MEL); Kydra Reefs, Mar 1974, *Rodd* 2653 (NSW); Katoomba area, Narrow Neck Plateau Drive, near start of Golden Stairs track, Oct 1984, *Taylor* 303 & *Coveny* (NSW); Kydra Peak, c. 40 km ESE of Cooma, Oct 1945, *Willis* s.n. [MEL2061293] (MEL). **Tasmania**. Coles Bay, Jun 1996, *Cave* 033 (AD, CANB, MEL).

***Distribution and habitat*:** *Pseudanthus divaricatissimus* occurs in a more or less continuous distribution from near Muswellbrook southwards to Bega with disjunct populations near Urbenville and Dubbo in New South Wales and in the Coles Bay area in eastern Tasmania. It is recorded as growing in heathland, shrubland or mallee woodland communities on sandy soils often on rocky sites mostly overlying sandstone. **Map 2.**

***Phenology*:** Flowers and fruits have been collected throughout the year.

***Notes*:** The disjunct northern populations of *P. divaricatissimus* (as represented by *Briggs* 2386 (MEL, NSW), *Henderson* & *Turpin* H3243 (BRI, NSW) and *Bean* 2506 (BRI)) are atypical of this species in having tepals in male flowers oblong in outline and thus having a superficial resemblance to those in male flowers of *P. ovalifolius*. However, these populations differ from *P. ovalifolius* in having generally shorter staminal filaments, shorter tepals in male flowers and biovulate rather than uniovulate locules in female flowers. Also, some difficulty may be experienced in separating the northern populations of *P. divaricatissimus* from those of *P. pauciflorus* subsp. *pauciflorus*. For discussion of their differences, see 'Affinities' under *P. pauciflorus*. Further collections and field studies of these northern populations to determine their standing are warranted.

Apart from the collections from Tasmania having numerous galls, there appears to be no significant morphological differences between the New South Wales and Tasmanian material of this species.

3. Pseudanthus ligulatus Halford & R.J.F.Hend. **sp. nov.** arte affinis *P. pimeleoides* Sieber ex Spreng. ut videtur sed foliis lamina lineari ad anguste oblonga vel raro lanceolata non lanceolata ad anguste ovata, ad apicem acuta apiculo rufo-brunneo ad 0.2 mm longo non attenuata apiculo albo ad 0.5 mm longo instructa, et floribus masculinis pedicellis brevioribus (< 2 mm non > 2 mm longis) et tepalis apiculatis rubro-brunneis non acutis ad obtusis ad apicem differt. **Typus:** Queensland. Cook District: Davies Creek NP, c. 16 km E of Mareeba, 15 April 1989, *R.J.F. Henderson & J.R. Clarkson* H3217 (holo: BRI; iso: K, MEL, NSW, distribuendi).

Diffuse to compact shrub 40–150 cm high; stems freely branching; branchlets glabrous. Leaves alternate or decussate; stipules triangular or ovate, 0.5–1.3 mm long, red-brown, acute to acuminate with a dark brown glandular tip, and with margins erose or irregularly lobed; decurrent margins glabrous; petiole 0.5–1.1 mm long, smooth or papillose; laminae flat or slightly concavo-convex, lanceolate, linear to narrowly oblong, 7–12 mm long, 1.1–1.8 mm wide, length/width ratio 5–15:1, smooth except for papillae on margin, glabrous; midrib obscure adaxially, slightly raised abaxially; tip straight, acute with a minute, recurved, red-brown apiculum up to 0.2 mm long; margins thickened and white-coloured. Flowers solitary in axils of upper leaves though appearing to be in terminal clusters; bracts narrowly triangular or narrowly ovate, 0.5–1 mm long, with crisped hairs on adaxial surface and on margins towards tip. Male flowers on pedicels 0.5–1.8 mm long; tepals 6, ± flat, linear, 7–15 mm long, 0.5–0.9 mm wide,

creamy white coloured, erect; apex acute or obtuse with minute red apiculum; receptacle ± glabrous; stamens 6, with filaments entire or bifid distally, free, 0.2–1.5 mm long, and anthers 0.5–0.8 mm long, papillose; disc irregularly lobed. Female flowers sessile; tepals 6, lanceolate or ovate, 1.2–3.7 mm long, 0.6–1 mm wide, pale green coloured with reddish tips, keeled, glabrous on both surfaces; apex obtuse, acute or acuminate; margins entire, serrate, irregularly toothed or fimbriate distally; receptacle ± glabrous. Ovary subglobose, 0.6–1 mm across; locules 3, biovulate; styles 1–1.3 mm long, erect and recurved distally. Fruits sessile; persistent tepals > half the length of the capsule; capsule ovoid, 5.8–7 mm long, 2.7–3.2 mm across, smooth, glabrous, green coloured. Seeds obloid, c. 3.8 mm long, c. 2.1 mm wide, c. 2.4 mm across; testa smooth, glossy brown; caruncle somewhat conical, c. 0.8 mm long, c. 1.2 mm wide.

***Distribution and habitat*:** *Pseudanthus ligulatus* is confined to Queensland where it occurs from the Mareeba district south to Charters Towers and east to Cumberland Islands in the north, with disjunct populations on the Glasshouse Mountains, near Brisbane in the south east.

***Affinities*:** *P. ligulatus* seems most closely related to *P. pimeleoides* but can be distinguished from that by having linear to narrowly oblong, rarely lanceolate leaf laminae with an acute tip that is ultimately terminated by a minute red-brown apiculum up to 0.2 mm long (as compared with lanceolate or narrowly ovate leaf laminae with an acute to attenuate tip that is ultimately terminated by a white apiculum up to 0.5 mm long), and male flowers with shorter pedicels (< 2 mm long as compared with mostly greater than 2 mm long) and a reddish brown apiculate tip on the tepals.

***Etymology*:** The specific epithet is from Latin *ligulatus*, ligulate or with a ligule, which refers to tongue-like tepals.

***Variability*:** The southern populations differ from those in the north in habit, length of filaments of stamens and the shape of tepals in female flowers, and appear worthy of formal recognition. The southern entity is therefore here treated as a distinct subspecies which can be distinguished using the following key.

Shrub up to 150 cm high; leaves evenly distributed along the branchlets; tepals of female flowers lanceolate to ovate, > 2 mm long . . . **3a. P. ligulatus** subsp. **ligulatus**

Shrub up to 50 cm high; leaves ± crowded towards the ends of the branchlets; tepals of female flowers ovate, < 2 mm long . . . . . **3b. P. ligulatus** subsp. **volcanicus**

3a. **Pseudanthus ligulatus** Halford & R.J.F.Hend. subsp. **ligulatus**

Shrub, 50–150 cm high. Stipules narrowly triangular to triangular. Leaves evenly distributed along the branchlets. Staminal filaments 0.2–0.7 mm long. Tepals of female flowers lanceolate to ovate; 2.1–3.7 mm long, 0.6–1 mm wide. **Fig. 2.**

***Selected specimens (from c. 50 examined)*: Queensland.** Cook District: Davies Creek, Lamb Range, Jun 1967, *Brass* 33549 (BRI, QRS); Ravenshoe, Jan 1932, *Brass* 1887 (BRI); Mt Mulligan, Apr 1985, *Clarkson* 5764 (BRI, MEL); Davies Creek NP, 2 km past carpark, Jun 1991, *Forster* PIF8524 (BRI, CANB, MEL); Herberton Weir, Wild River, Feb 1990, *Forster* PIF6246 (BRI, MEL); S.F.R.607, Davies Creek, May 1971, *Hyland* 5012 (BRI, CANB, NSW); S.F.R.607, Mulgrave L.A., Nov 1973, *Irvine* 704 (BRI, MEL, NSW); S.F.R.607, Mulgrave L.A., Nov 1973, *Irvine* 705 (BRI, CANB); Daives Creek, Apr 1962, *McKee* 9328 (BRI, CANB, NSW); Wild River gorge, 5 miles [c. 8 km] from Herberton, Jun 1972, *Wrigley & Telford* NQ756 (CANB). Burke District: "Warang" Holding, White Mountains, c. 38 km NNW of Torrens Creek township, Jul 1988, *Fell* DF1297 & *Swain* (BRI). North Kennedy District: Mount Bertha, Gloucester Island, Mar 1994, *Batianoff* 9403314 *et al.* (BRI); Mt Abbot, 50km W of Bowen, Mar 1992, *Bean* 4217 (BRI); Upper Torrens Creek, White Mountains NP, Apr 1992, *Bean* 4281 (BRI); E of Baal Gammon Mine, c. 7 km W of Herberton, Jun 1983, *Conn* 1373 & *DeCampo* (BRI, MEL). Cape Upstart NP, Aug 1971, *Wyatt* 15 (BRI). South Kennedy District: Shaw Island, Nov 1985,

Batianoff 3094 & *Dalliston* (BRI, CANB); Thomas Island, Whitsunday Group, Dec 1984, *Warrian* CW81 (BRI).

***Distribution and habitat*:** *Pseudanthus ligulatus* subsp. *ligulatus* occurs in north-eastern Queensland from near Mareeba, near Hughenden and from Cape Upstart near Ayr south to the Cumberland Islands east of Proserpine. It is recorded as growing in heathland, open eucalypt woodland or forest communities or rarely in rainforest communities, on exposed mountain tops or on hillsides of exposed rock pavement of granite or sandstone; also along creek banks and in sheltered gorges. The soils are noted to be generally shallow and sandy in texture. **Map 3.**

***Phenology*:** Flowers have been collected throughout the year, fruits in April, May, July and October.

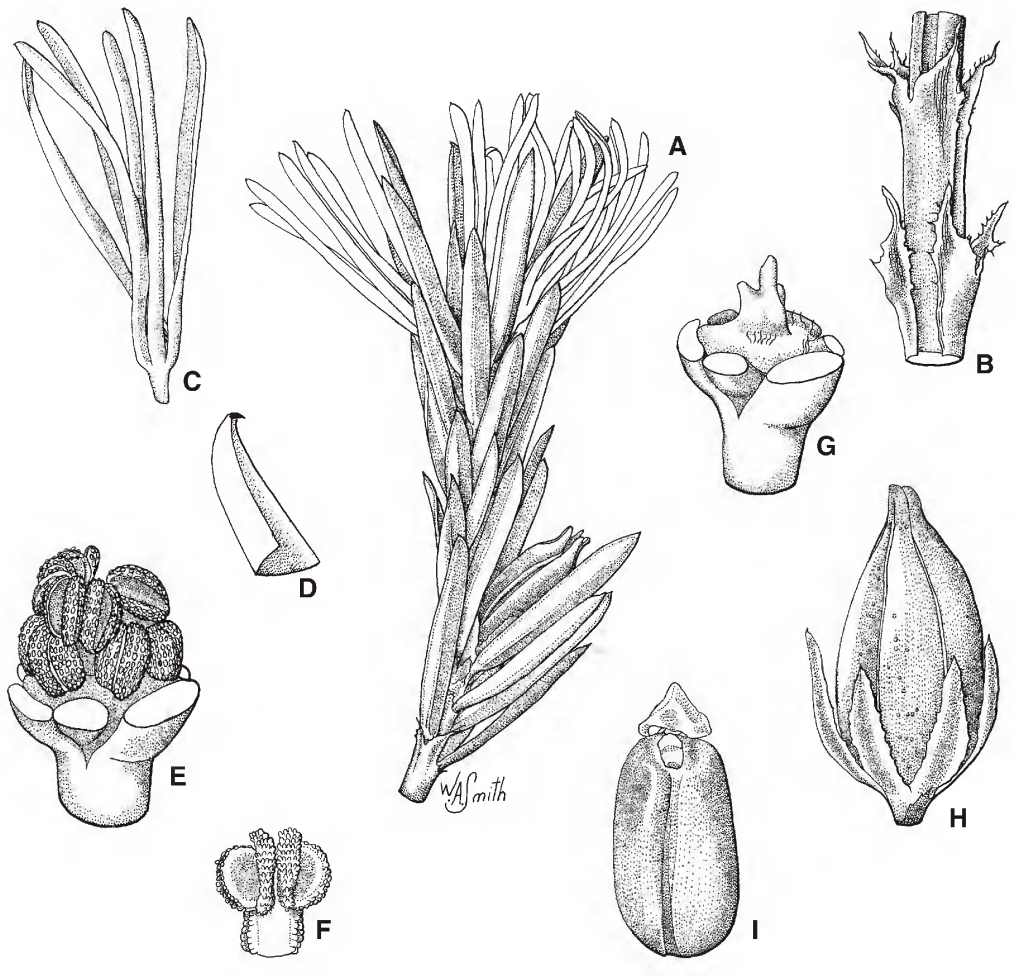


Fig. 2. ***Pseudanthus ligulatus*** subsp. ***ligulatus***. A. branchlet with flowers and fruit × 3. B. section of branchlet with leaves removed showing stipules with decurrent margin × 12. C. male flower from side × 4. D. apex of tepal from male flower × 24. E. male flower with tepals removed × 18. F. stamen × 24. G. male flower with tepals and stamens removed showing cental disc × 18. H. fruit with persistent tepals × 6. I. seed × 8. A-I from *Henderson* & *Clarkson* H3217 (BRI). Del. W. Smith.

3b. Pseudanthus ligulatus subsp. **volcanicus** Halford & R.J.F.Hend. **subsp. nov.** ab *P. ligulatus* Halford & R.J.F.Hend. subsp. *ligulatus* plantis statura diffusa et breviora (frutex diffusus usque ad 50 cm non 40–150 cm altus), foliis in ramulis distaliter confertis non aequaliter distributis et floribus femineis tepalis ovatis et < 2 mm longis non lanceolatis ad ovatis et > 2 mm longis differt. **Typus:** Queensland. MORETON DISTRICT: Mount Tibrogargan, Glasshouse Mountains, 8 March 1991, *A.R.Bean* 2871 (holo: BRI).

Diffuse shrub up to 40 cm high. Stipules triangular to ovate. Leaves ± crowded towards the ends of the branchlets. Staminal filaments 0.5–1.5 mm long. Tepals of female flowers ovate, 1.2–1.8 mm long, 0.6–0.8 mm wide.

***Selected specimens (from 14 examined)*: Queensland.** MORETON DISTRICT: Mt Tibrogargan, Aug 1975, *Coveny* 6723 & *Hind* (BRI, NSW); Crookneck, Glasshouse Mountains, Jul 1939, *Goy* & *Smith* 697 (BRI); Mt Crookneck, Glasshouse Mountains, May 1935, *Goy* s.n. [AQ205142] (BRI); Mt Coonowrin, Glasshouse Mountains, Oct 1973, *Hassall* 73128 (BRI); Mount Tibrogargan, Mar 1974, *Hassall* 7411 (BRI); Mt Coonowrin, Glasshouse Mountains, Sep 1930, *Hubbard* 4117 (BRI); Mt Crookneck, Glasshouse Mountains, Dec 1967, *Smith* s.n. [AQ205143] (BRI, CANB); Mt Coonowrin, Aug 1968, *Smith* 14005 (BRI); Mt Tibrogargan, Glasshouse Mountains, Apr 1984, *Telford* 9690 (CANB, MEL); Mt Coonowrin, Glasshouse Mountains, Jan 1966, *Whaite* & *Whaite* 3073 (BRI, NSW).

***Distribution and habitat*:** *Pseudanthus ligulatus* subsp. *volcanicus* is restricted to the slopes of the Glasshouse Mountains in south-east Queensland. It is recorded as growing in crevices and along ledges on trachyte cliff faces. **Map 4.**

***Phenology*:** Flowers have been collected throughout the year, fruits in August.

***Etymology*:** The epithet is derived from Latin *volcanicus*, volcanic, in reference to where this subspecies occurs, i.e. on mountains of volcanic origin.

4. Pseudanthus micranthus Benth., Fl. Austral. 6: 59/60 (1873). **Type:** South Australia. [without locality, without date,] [*J.*] *Whittaker* s.n. (holo: K (cibachrome at BRI)).

Phyllanthus tatei F.Muell., S. Sci. Rec. 2: 55 (1882); *Micrantheum tatei* (F.Muell.) J.M.Black, Fl. S. Austral. 1st edn: 356 (1924). Type: South Australia. Bundaleer Range, [without date,] [*R. Tate* s.n.] (holo: MEL [MEL 107258]).

***Illustrations*:** J.Z. Weber & D.J. Morley (1985: p 212); J.Z Weber (1986: p 765, fig.409).

Compact shrub up to 30 cm high; stems ascending to erect, intricately branched; branchlets pubescent with minute spreading hairs up to 0.2 mm long. Leaves alternate; stipules triangular to filiform, 0.4–1 mm long, red-brown, with margins entire; decurrent margins obscure or absent; petiole 0.3–0.4 mm long, smooth; laminae ovate or orbicular, 1.7–5 mm long, 1.2–2.7 mm wide, length/width ratio 1–3:1, smooth except for papillae on margins, glabrous; midrib obscure adaxially, slightly raised abaxially; tip straight or recurved, acute to obtuse, sometimes with a minute recurved apiculum; margins flat, not noticeably thickened. Flowers in axils of upper leaves; bracts triangular to filiform, c. 0.5 mm long, pubescent on adaxial surface. Male flowers 1–3 per axil, on pedicels 0.4–1.3 mm long; tepals 6, ± flat or concave, subequal, ovate, suborbicular or obovate, 0.6–1.6 mm long, 0.5–1 mm wide, yellow coloured with reddish tinge, spreading; apex obtuse; margins entire; receptacle glabrous; stamens (2 or)3, with filaments entire, free at base, adhering near apex by interlocking papillae, 0.8–1 mm long, and anthers 0.4–0.5 mm long, smooth; disc 3-lobed. Female flowers solitary, sessile; tepals 4–6, ovate, 1.1–1.5 mm long, 0.8–1 mm wide, yellow coloured with reddish brown margin, slightly keeled, glabrous on both surfaces; apex obtuse; margins erose; receptacle glabrous. Ovary mostly 3-locular and trigonal-globose or if 2-locular then laterally compressed, 0.9–1.1 mm across; locules biovulate; styles 1–2 mm long, spreading and recurved distally. Fruits sessile; persistent tepals ≤half of the length of capsule; capsule ± ovoid, 3.5–5.5 mm long, 3–4.8 mm across, smooth or slightly rugose, glabrous, creamy green coloured becoming pinkish red with age. Seeds subglobose to ovoid, 2.5–3.5 mm long, c. 2.3 mm across, smooth, somewhat glossy brown; exostome pit well developed; caruncle subconical, c. 0.9 mm long, c. 1.2 mm wide.

***Additional specimens*: South Australia.** Inman Valley turnoff on Waitpinga Road, Sep 1981, *Bates* 1015 (AD); top of cliffs near Waitpinga, Sep 1981, *Bates* 1014 (AD); c. 2 km NE of Newland Head, Nov 1981, *Bushman* 42 (AD); Kangaroo Island, Flinders Chase NP, May 1995, *Davies* 764 (AD); Victor Harbour, Jul 1983, *Davies* 553 & *Bushman* (AD); Waitpinga Beach, Jul 1983, *Davies* 515 & *Bushman* (AD); Willow Creek, Oct 1955, *Fraser* (AD); Victor Harbour, Jul 1970, *Hunt* 3215 (AD); Port Elliot, Apr 1895, *Hussey* (AD); Port Elliot, Aug 1967, *Kraehenbuehl* 3451 (AD); Inman Valley, Oct 1987, *Murfet* 612 (AD); Kangaroo Island, Sep 1995, *Overton* 2570 (AD)

***Distribution and habitat*:** *Pseudanthus micranthus* occurs in South Australia where it is restricted to the southern Lofty Ranges from Mount Compass to Cape Jervis, and Kangaroo Island. It is recorded as growing in shrubland, heathland and open mallee communities on sandy soils. **Map 5.**

***Phenology*:** Flowers have been collected in January and from April to November, fruits in January and from July to October.

***Notes*:** *Pseudanthus micranthus* is easily distinguished from all other species of *Pseudanthus* by having stems with obscure decurrent stipule margins or decurrent stipule margins absent from stems, stamens 3 and free at base but joined at apex by interlocking hairs, and branchlets with erect translucent minute hairs.

In his protologue, Bentham (1873) stated of this species that it was a "much-branched glabrous shrub". However, examination of the type clearly shows minute hairs on the branches.

5. Pseudanthus orbicularis (Müll.Arg.) Halford & R.J.F.Hend. **comb. nov.**; *Caletia divaricatissima* var. *orbicularis* Müll.Arg., Flora 47(31): 486 (1864); *Caletia orientalis* var. *orbicularis* (Müll.Arg.) Baill., Adansonia 6: 327 (1866); *Pseudanthus divaricatissimus* var. *orbicularis* (Müll.Arg.) Benth., Fl. Austral. 6: 60 (1873), as '*orbiculare*'. **Type:** Victoria. summit of rocky mountains on the M'Allister [Macalister] River, Gippsland, [without date,] *Dr* [*F.*] *Mueller* s.n. (holo: K (ex herb. Hook.); iso: MEL [MEL2062900, MEL2062899 & MEL2062916]; possible iso: MEL [MEL224491]).

Pseudanthus divaricatissimus var. *orbicularis* Ewart, Fl. Victoria 725 (1930), as 'orbiculare', *nom. illeg.* **Type:** not designated.

***Illustration*:** J.A. Jeanes (1999: p.73, fig.11e), as *P. divaricatissimus*.

Compact shrub to up to 1.5 m high and wide; stems ascending to decumbent, freely divaricately branching; branchlets glabrous. Leaves decussate; stipules triangular, 0.4–0.7 mm long, red-brown, acute, and with margins entire or fimbriate; decurrent margins glabrous or hispidulous; petiole 0.2–0.6 mm long, smooth; laminae ± flat or slightly concavo-convex, broadly elliptic to orbicular or rarely broadly ovate, 1.4–3.6 mm long, 1.2–2.3 mm wide, length/width ratio 1–1.7:1, smooth, glabrous or with minute hairs on margin; midrib obscure adaxially, slightly raised abaxially; tip ± straight, rounded or emarginate, usually with a minute red-brown apiculum; margins flat or slightly recurved, not obviously thickened. Flowers solitary in axils of upper leaves; bracts narrowly triangular or ovate, 0.3–0.5 mm long, pubescent on margin and abaxial surface. Male flowers on pedicels 0.4–0.6 mm long; tepals 6, convex-concave, ovate or obovate, 0.9–1.3 mm long, 0.5–0.8 mm wide, creamy white or red coloured, spreading; apex rounded to obtuse, margins entire; receptacle glabrous; stamens 6, with filaments entire, free, 0.4–1.2 mm long, and anthers 0.3–0.4 mm long, smooth; disc irregularly lobed. Female flowers sessile; tepals 5 or 6, ovate or elliptic, 1.4–1.7 mm long, 0.6–0.9 mm wide, pale red coloured, slightly keeled, glabrous; apex acute to obtuse; margins irregularly toothed; receptacle glabrous. Ovary trigonal-globose, 0.6–0.7 mm across, glabrous, tuberculate along ridges; locules 3, biovulate; styles 0.6–0.7 mm long, erect and recurved distally. Fruits sessile; persistent tepals ≤the length of the capsule; capsule narrowly ovoid, 3.8–4.5 mm long, 1.2–2.2 mm across, smooth or tuberculate along ridges, glabrous, mottled green and red. Seeds ± cylindrical, laterally compressed, 3.1–3.3 mm long, 1.1–1.5 mm wide, 1.3–1.8 mm across; testa smooth or slightly rugose, dull reddish brown; exostome pit well developed; caruncle squat-conical, c. 0.6 mm long, c. 0.7 mm wide.

***Selected specimens (from 45 examined)*: New South Wales.** Nadgee Nature Reserve, Merrica River crossing of main road from entrance of reserve to Newtons Beach, Jan 1985, *Albrecht* 1539 (MEL, NSW); Nullica State Forest, Jan 1986, *Albrecht* 2409 (MEL); rhyolite knoll SSE of Nethercote Falls on the Yowaka River, Oct 1985, *Albrecht* 2036 (CANB, MEL, NSW); 3 km WSW of the Old Hut Creek crossing of the Nethercote Road, Nullica State Forest, Oct 1985, *Albrecht* 2067 (CANB, MEL, NSW); Deua NP, c. 20 km WNW of Moruya, Mar 1985, *Beesley* 383 & *Binns* (CANB, MEL, NSW); mountain peak 2.5 km NE of Mount Poole, Yambulla State Forest, Jul 1986, *Briggs* 1997 & *Albrecht* (CANB, NSW); Bunbury State Forest, 14 miles (c. 22.5 km) E of Parkes, Oct 1973, *Coveny* 5253 (NSW); Hervey Range, E of Peak Hill, May 1978, *Harden* s.n. [NE038787A] (NE); c. 15 km SE of Peak Hill on road to Molong via Baldry, Harvey Range, Sep 1989, *Henderson* & *Turpin* H3246 (AD, BRI, NSW); Yumbulla State Forest, c. 24 km S of Eden, Newtons crossing Picnic area, Feb 1984 *Taylor* 204 & *James* (MEL, NSW). **Victoria**. c. 5 miles [c. 8 km] NW of Mt Margaret, Jan 1973, *Beauglehole* ACB41287& *Chesterfield* (MEL, NSW); S side of Barrytennie Road, 12.8 km NW of Mid Western Highway turnoff (which is 7 km W of Cowra), Sep 1997, *Jobson* 4820 & *Mills* (BRI, NSW); c. 16 miles [c. 26 km] NE of Buchan, Jan 1953, *Melville* 3069 *et al.* (K, MEL, NSW); Brisbane Ranges NP, c. 250 m SW of Aeroplane Road turnoff on Reids Road, Oct 1992, *Stajsic* 619 *et al.* (MEL); Werribee Gorge State Park, Jan 1991, *Stajsic* 136 (MEL); Maramingo Hill, Sep 1946, *Wakefield* 4227 (MEL); Mt Ray summit area, c. 19 km NE of Briagolong, Dec 1998, *Walsh* 4902 & *Anderson* (MEL); Mt Margaret track, c. 0.8 km NE from Tamboritha Road, Apr 1992, *Walsh* 3438 & *Albrecht* (BRI, MEL); 3.5 km NW from Genoa township, Oct 1991, *Walsh* 3221 (BRI, MEL); Wellington River, 7.5 km N of Licola, Jan 1984, *Yugovic* 019 (CANB, MEL).

***Distribution and habitat*:** *Pseudanthus orbicularis* occurs in a number disjunct localities in south-eastern Australia, from Ulan, Wellington and Cowra areas in the Central Western Slopes Subdivision, and Mourya and Eden districts in South Coast Subdivision, New South Wales, extending into far eastern Gippsland, and westwards to Werribee Gorge, Victoria. It is recorded as growing in rocky sites on hillsides and ridges in shrubland, low woodland with heath understorey or open eucalypt forest with shrubby understorey. The soils are shallow, mostly sandy or occasionally sandy loam or sandy clay, often overlying rhyolite or granite, or less frequently sandstone. **Map 6.**

***Phenology*:** Flowers and fruits have been collected throughout the year.

***Notes*:** *Pseudanthus orbicularis* seems most closely related to *P. divaricatissimus* but differs from that in having orbicular rather than narrowly elliptic to elliptic or ovate leaf laminae, leaf margins not prominently thickened, narrower capsules (1.2–2.2 mm rather than 2.4–2.8 mm across) and seed ± cylindrical and 3.1–3.3 mm long rather than broadly ovoid and 2.4–2.8 mm long. *Pseduanthus obricularis* is sometimes confused with *P. ovalifolius* but can be distinguished from that by the shape of the tepals in its male flowers, leaf margins not prominently thickened and its biovulate locules.

6. Pseudanthus orientalis F.Muell., Fragm. 2: 14 (1860); *Caletia orientalis* (F.Muell.) Baill., Adansonia 6: 327 (1866); *Caletia orientalis* (F.Muell.) Baill. var. *orientalis*, Baill., Adansonia 6: 327 (1866). **Type:** New South Wales. Botany Bay, Jan 1857 (or Apr 1855), *F. Mueller* s.n. (lecto, here chosen: MEL [MEL2064467]).

Caletia linearis Müll.Arg., Linnaea 32: 79 (1863). **Type:** [New South Wales.] Port Jackson, in 1816, *A. Cunningham* (syn: G-DC *n.v.*, microfiche IDC 800–73. 2453: III. 3, [top right]); Port Jackson, in 1826, [*J.S.C.*] *Dumont d'Urville* (syn: G-DC *n.v.*, microfiche IDC 800–73. 2453: III. 3 [bottom left]).

Compact shrub to 0.5 (rarely1) m high; stems ascending to decumbent or rarely prostrate, freely branching; branchlets glabrous. Leaves alternate or decussate; stipules broadly triangular, 0.5–0.7 mm long, pale red-brown becoming grey-white with age, acuminate, with margins irregularly toothed; decurrent margins glabrous; petiole 0.4–0.6 mm long, smooth; laminae concavo-convex, linear, narrowly oblong to oblong or oblanceolate, 3.5–13 mm long, 0.7–1.7 mm wide, length/width ratio 3–9:1, smooth, glabrous or minutely papillose on margins; midrib obscure adaxially, slightly raised abaxially; tip straight or recurved, obtuse to rounded, sometimes with a minute red-brown apiculum; margins flat, thickened and white-coloured. Flowers solitary in axils of upper leaves, often appearing to be in terminal clusters; bracts narrowly triangular, 0.6–1 mm long, pubescent on adaxial surface. Male flowers on pedicels 1–2 mm long; tepals 6,

slightly convex-concave, narrowly oblong or sometimes narrowly obovate, 0.9–1.6 mm long, 0.4–0.8 mm wide, pale yellow to creamy-white coloured, spreading; apex obtuse sometimes with minute reddish brown apiculum; margins entire or toothed; receptacle glabrous; stamens 6, with filaments entire, free, 0.2–0.6 mm long, and anthers 0.3–0.4 mm long, smooth; disc irregularly lobed. Female flowers sessile; tepals 6, ovate to elliptic, 1–1.4 mm long, 0.6–0.7 mm wide, pale green coloured with reddish tips, slightly keeled, pubescent on adaxial surface distally, glabrous on abaxial surface; apex obtuse; margins erose; receptacle glabrous. Ovary trigonal-globose, 0.5–0.7 mm across, glabrous; locules 3, biovulate; styles 0.3–0.6 mm long, erect and spreading distally. Fruits sessile; persistent tepals ≤half the length of the capsule; capsule narrowly ovoid, 3.5–4 mm long, 1.5–1.7 mm across, smooth or slightly rugose, glabrous, mottled green and red or reddish brown. Seeds narrowly ovoid to cylindrical, 2.2–3.5 mm long, 1.1–1.5 mm across; testa smooth, somewhat glossy brown; exostome pit not well developed; caruncle conical, 0.5–0.9 mm long, 0.6–0.9 mm wide.

***Selected specimens (from c. 80 examined)*: Queensland.** Port Curtis District: Littabella NP, c. 40 km NW of Bundaberg, Nov 1993, *Bean* 7012 (BRI); 4 km WSW of Stockyard Point, May 1996, *Fell* 4615 (BRI); 4 km from Byfield turnoff to Five Rocks, Sep 1977, *Powell* 885 & *Armstrong* (BRI, NSW). Wide Bay District: Wide Bay Military Training area, c. 10 km NNW of Camp Kerr, Sep 1980, *Adams* 3576 (BRI, CANB); Marcus Beach, S of Noosa, Mar 1993, *Bean* 5832 (BRI); Sandy Cape, Fraser Island, Apr 1966, *Blake* 22718 (BRI); Burrum Coast NP, Kinkuna section, Oct 1996, *Forster* PIF19978 & *Leiper* (BRI, MEL); Noosa NP, Noosa, Dec 1984, *Sharpe* 3645 & *Batianoff* (BRI, NSW); Upper Noosa River, 22 km N of Tewantin, Aug 1976, *Telford* 4356 (CANB). Moreton District: Beerwah State Forest, Mar 1953, *Melville* 3545 *et al.* (BRI, CANB, K); Caloundra, Aug 1933, *Blake* 4879 (BRI); Moreton Island, c. 0.9 km WSW of Cape Moreton, Dec 1974, *Durrington* 1414 & *Batianoff* (BRI); Mt Coolum, Nov 1987, *Henderson* H3110 (BRI); Peel Island, Oct 1994, *Thompson* & *Bean* MOR444 (BRI). **New South Wales**. Captain Cook's historical landing site, Kurnell, Aug 1976, *Coveny* 7761 & *Hind* (NSW); La Perouse, May 1976, *Coveny* 7670 & *Davies* (NSW); Crowdy Head, N of Harrington, Feb 1969, *Blaxell* 190 (NSW); Petrol Depot at SW Rocks, 22 miles (c. 35.2 km) by road NE of Kempsey, Sep 1967, *Coveny* s.n. (NSW); Crowdy Bay National Bay, 5.3 km S of Laurieton Bridge on Diamond Head road, Mar 1981, *Haegi* 2043 (NSW); 5 miles (c. 8 km) NE of Woodburn, Feb 1971, *O'Hara* & *Coveny* 3504 (BRI, NSW); c. 10 km NW of Iluka, Dec 1967, *Williams* s.n. [NE024351A] (NE).

***Distribution and habitat*:** *Pseudanthus orientalis* occurs in coastal areas from Shoalwater Bay, central Queensland, southwards to Botany Bay, New South Wales. It is recorded as growing on sandy soils in moist coastal heath, shrubland or open *Banksia* woodland with heath understorey, on coastal flats, headlands and stabilised beach dunes. It also occurs in low open forest with heath or shrub understorey. **Map 7.**

***Phenology*:** Flowers and fruits have been collected throughout the year, particularly from August to November.

***Typification*:** Mueller (1860) did not cite any particular specimen in his protologue of this species which he said occurred "in ericetis litoralibus Australiae orientalis extratropicae". The specimen selected here as lectotype predates Mueller's publication, has the name *P. orientalis* on the label in Mueller's hand and matches the description of the species given in the protologue.

7. Pseudanthus ovalifolius F.Muell., Trans. Philos. Inst. Victoria 2: 66 (1858); *Caletia ovalifolia* (F.Muell.) Müll.Arg., Linnaea 34: 55 (1865). **Type:** [Victoria.] Grampians, [in 1857], [*C.*] *Wilhelmi* s.n. (lecto, here chosen: MEL [MEL694290]; possible isolecto: MEL [MEL2062910 (ex herb. Sonder), MEL2062903 (ex herb. Sonder)], K (element on the right).

***Illustration*:** J.A. Jeanes (1999: p.73, fig.11d); M.G. Corrick & B.A. Fuhrer (2000: p.82).

Straggling to compact shrub to 30 cm high; stems ascending to erect, divaricate; branchlets glabrous. Leaves subopposite, decussate or rarely alternate; stipules broadly triangular to broadly ovate, 0.5–0.9 mm long, red-brown becoming grey with age, acute, obtuse or acuminate with a dark brown glandular tip, and with margins erose, fimbriate or irregularly lobed; decurrent margins hispidulous; petiole 0.1–0.4 mm long, smooth; laminae concavo-convex, narrowly oblong-elliptic, elliptic or sometimes orbicular, (1.8–)2.2–5(–7.5) mm long, 1–2.1 mm wide, length/width ratio 1–4:1, smooth except for minute papillae on margins and sometimes on the midrib abaxially, glabrous except for

occasional minute hispid hairs on midrib abaxially; midrib obscure adaxially, slightly prominent abaxially; tip straight or slightly recurved, obtuse to rounded and sometimes terminated by a minute, dark red-brown mucro; margins flat, thickened and white-coloured. Flowers solitary in axils of upper leaves but sometimes appearing to be in terminal clusters; bracts ovate, 1–1.5 mm long, entire or 3-toothed distally, pubescent on margins and on the adaxial surface. Male flowers on pedicels 0.5–1.3 mm long; tepals 6, flat, narrowly oblong to oblong or narrowly obovate, 1.3–2.4 mm long, 0.5–0.8 mm wide, creamy white coloured, spreading; apex rounded to obtuse; margins entire; receptacle glabrous; stamens 6, with filaments entire, free, 0.5–1.8 mm long, and anthers 0.3–0.5 mm long, smooth; disc 3-lobed with each lobe notched at tip. Female flowers sessile; tepals 5 or 6, lanceolate to narrowly ovate, 1.1–2.2 mm long, 0.2–0.6 mm wide, reddish brown coloured at base and creamy-white distally, slightly keeled, glabrous on both surfaces; apex acute to acuminate; margins erose or irregularly toothed; receptacle glabrous. Ovary trigonal-globose, 0.7–1.2 mm across, glabrous; locules 3, uniovulate; styles 1.3–2.3 mm long, erect and spreading distally. Fruits sessile; persistent tepals ≤half the length of the capsule; capsule ovoid, 3.5–4 mm long, 1.9–2.2 mm across, ± smooth, glabrous, green coloured. Seeds ovoid, 2.5–2.7 mm long, 1.5–1.7 mm across; testa smooth, dull brown; exostome pit well developed; caruncle ± pyramidal, c. 0.6 mm long, c. 0.6 mm wide.

***Selected specimens (from 52 examined)*: New South Wales.** North Ben Boyd NP, 6 km N of Eden, Oct 1978, *Newman* s.n. [MEL204781] (MEL). **Victoria.** 15 miles [c. 24 km] NNE of Bendigo, near the Huntly-Kamarooka road, Oct 1959, *Aston* 418 (MEL); Mt Victory, Reids Lookout, Grampians, Oct 1950, *Beauglehole* 8355 (MEL); Little Desert, east-west access track W of Nhill-Gymbowen road, Sep 1975, *Corrick* 5334 (MEL); ridge near Kappa Cave, Victoria Range, The Grampians, Sep 1963, *Filson* 5291 (MEL); Grampians, Oct 1952, *Gauba* s.n. (CANB [CBG001513], NSW [NSW130415]); Campbell Road, 1.7 km W of Tennyson road, 26.2 km N of Bendigo, Aug 1995, *Jobson* 3685 (BRI, MEL, NSW); along the Goad Track at the summit of Victoria Range about 3 km S of the Fertility Shelter, Sep 1989, *LeBreton* s.n. [MEL234094] (MEL); Flagstaff Hill, 5.5 miles [c. 8.8 km] N of Eaglehawk, Sep 1952, *Melville* 1255 *et al.* (K, MEL, NSW); Grampian mountains, northern end of Mt Stapylton, Jul 1961, *Muir* 2141 (MEL); Central Whipstick, Aug 1960, *Perry* s.n. [MEL530704] (MEL); Whipstick Scrub, N of Bendigo, Oct 1966, *Phillips* s.n. [CBG039579] (CANB); Mt Rosea, Grampians, Nov 1971, *Phillips* 508 (CANB); Kamarooka Forest, Campbell Road, c. 2 km W from Kamarooka East-Huntley road, Oct 1991, *Walsh* 3097 (BRI, MEL); Grampians, 600 m from Wallaby Rocks summit, Oct 1986, *Westaway* 266 (MEL). **Tasmania.** Tanners Bay Mines, Flinders Island, Furneaux Group, Jul 1973, *Whinray* 2211 (CANB); Cape Barren Island, Furneaux Group, May 1969, *Whinray* 434 (MEL); Cape Barren Island, Furneaux Group, Oct 1973, *Whinray* 633 (MEL); Cape Barren Island, Sep 1985, *Ziegeler* s.n. [HO95818] (HO).

***Distribution and habitat*:** *Pseudanthus ovalifolius* occurs in a number of scattered localities in south-eastern Australia from near Eden, New South Wales, Little Desert, The Grampians, and Bendigo and Bairnsdale districts, Victoria; and on Cape Barren and Flinders Islands, Tasmania. It is recorded as growing on shallow sandy or clay soils on rocky hillsides in heathland, shrubland including shrubland dominated by *Melaleuca uncinata*. It also occurs occasionally in mallee communities. **Map 8.**

***Phenology*:** Flowers have been collected from February to November, fruits in December.

***Typification*:** Mueller (1858) based his description of *P. ovalifolius* on material collected by J.F. [Carl] Wilhemi from The Grampians, and from the Serra and Victoria Ranges in Victoria. Seven sheets of collections made by Wilhemi from the Grampians have been located at MEL. A further sheet has been located amongst material on loan to BRI from K and it carries 2 specimens and 2 labels, both in Mueller's hand. In his protologue, Mueller's described the male flowers but not the female flowers of the species. Sheet MEL694290 at MEL is here chosen as lectotype because it is the best-preserved specimen, has male flowers attached and the label is annotated by Mueller with the name *P. ovalifolius*.

***Notes*:** The uniovulate condition of *P. ovalifolius* appears to be stable and constant in this species. This condition is presumed derived by reduction from the biovulate state seen in the other species of *Pseudanthus* and it clearly distinguishes *P. ovalifolius* from all other species of that genus. However, there is no doubt that *P. ovalifolius* belongs to it.

8. Pseudanthus pauciflorus Halford & R.J.F.Hend. **sp. nov.** arte affinis *P. pimeleoidi* Sieber ex Spreng. ut videtur sed foliis lamina anguste obovata, anguste elliptica vel anguste oblongo-elliptica non anguste lanceolata ad lanceolata vel ovata, floribus masculinis minoribus et minus conspicuis tepalis 2.7–4.8 non 5–11 mm longis in pedicellis brevioribus (0.7–2.2 mm non 2–5 mm longis), et floribus in pseudo-fasciculis distalibus paucioribus differt. In additamentis haec species affinis formae boreali *P. divaricatissimi* (Müll.Arg.) Benth. aliquantum sed floribus masculinis tepalis 2.7–4.8 non 0.8–1.5 mm longis et floribus femineis tepalis lanceolatis vel raro oblanceolatis non ovatis ad late oblongis differt. **Typus:** Queensland. Moreton District: Mt Ernest, Mt Barney NP, 17.7 km SW of Rathdowney, 17 March 2001, *D.A. Halford* Q7000 (holo: BRI; iso: MEL, distribuendi)

Compact shrub to 60 cm high; stems ascending to erect, freely branching; branchlets glabrous. Leaves alternate or decussate; stipules triangular or ovate to broadly ovate, 0.8–1.3 mm long, red-brown, acute to acuminate with dark brown glandular tip, and with margins erose to fimbriate; decurrent margins glabrous; petiole 0.5–0.8 mm long, smooth; laminae concavo-convex, narrowly elliptic, narrowly obovate or narrowly oblong-elliptic, 3.5–14 mm long, 1–2.2 mm wide, length/width ratio 2–6:1, smooth except for minute papillae on midrib abaxially, glabrous except for minute scabrid hairs on margins and sometimes on midrib abaxially; midrib obscure adaxially, slightly prominent abaxially; tip recurved, obtuse or subacute, with a translucent mucro up to 0.2 mm long; margins flat, thickened and white-coloured. Flowers solitary in axils of upper leaves though appearing to be in terminal clusters; bracts narrowly triangular to ovate, 1–3 mm long, glabrous or with pale brown crisped hairs on adaxial surface distally. Male flowers on pedicels 0.7–2.2 mm long; tepals 6, ± flat, narrowly oblong or narrowly obovate, 2.7–4.8 mm long, 0.6–1.2 mm wide, creamy white coloured, erect but slightly recurved distally; apex acute, obtuse or rounded; margins entire; receptacle glabrous; stamens 6, with filaments ± entire, free, 0.1–0.6 mm long, and anthers 0.3–0.5 mm long, papillose; disc small, not lobed, hemispherically domed. Female flowers sessile; tepals 4–6, lanceolate (when reddish brown) or rarely oblanceolate (when green), 0.5–4 mm long, 0.2–0.8 mm wide, keeled, glabrous on both surfaces; apex acute to acuminate; margins erose or fimbriate; receptacle glabrous. Ovary trigonal-globose, 0.4–0.8 mm across, glabrous or tuberculate distally; locules 3, biovulate; styles 0.6–1.1 mm long, erect and recurved distally. Fruits sessile; persistent tepals > half the length of the capsule; capsule ovoid, 2.7–4 mm long, 1.5–2.5 mm across, tuberculate distally, glabrous, green coloured though sometimes with dark reddish blushes. Seeds obloid to ovoid, 2.5–3 mm long, 1.5–1.9 mm wide, 1.7–2.2 mm across; testa smooth, dull or glossy brown; caruncle pyramdial, 0.5–0.6 mm long, 0.6–1.3 mm wide.

***Distribution and habitat*:** *Pseudanthus pauciflorus* is disjunct in its distribution with populations occurring from Blackdown Tableland to near Taroom in central Queensland and from Rathdowney in south-east Queensland southward to Port Macquarie on the north coast of New South Wales.

***Affinities*:** *Pseudanthus pauciflorus* seems most closely related to *P. pimeleoides* but differs from that by having narrowly obovate, narrowly elliptic or narrowly oblong-elliptic rather than narrowly lanceolate to lanceolate or ovate leaf laminae, smaller and less conspicuous male flowers with tepals 2.7–4.8 mm long rather than 5–11 mm long, on shorter pedicels (0.7–2.2 mm long as compared with 2–5 mm long), and the distal pseudo-clusters of flowers being less floriferous. *Pseudanthus pauciflorus* is somewhat similar in appearance to the northern form of *P. divaricatissimus* but can be distinguished from that by its longer tepals in male flowers (2.7–4.8 mm long as compared with 0.8–1.5 mm long), and lanceolate or rarely oblanceolate rather than ovate or broadly oblong tepals in female flowers.

***Variability*:** The northern and southern populations of *P. pauciflorus* differ somewhat in habit, leaf lamina shape, the length of the pedicel in male flowers and the length of tepals in female flowers. Although some characters

overlap somewhat, the populations appear worthy of formal recognition. These entities are here treated as subspecies which can be distinguished using the following key.

Pedicels of male flowers 1.2-2.2 mm long; tepals of female flowers 0.5-2.9 mm long ..... **8a. P. pauciflorus** subsp. **pauciflorus**

Pedicels of male flowers 0.7-1.1 mm long; tepals of female flowers 3-4 mm long ..... **8b. P. pauciflorus** subsp. **arenicola**

8a. Pseudanthus pauciflorus Halford & R.J.F.Hend. subsp. **pauciflorus**

Pseudanthus sp. (Tylerville P.I.Forster+ PIF11510); Forster & Halford (2002, p. 73).

Leaf laminae narrowly elliptic, narrowly obovate, or rarely narrowly oblong-elliptic, 3.5–7.3(–9.3) mm long, 1.3–2.2 mm wide. Male flowers on pedicels 1.2–2.2 mm long. Female flowers with 4–6 tepals; tepals lanceolate, 0.5–2.9 mm long, up to 0.2 mm wide. **Fig. 3.**

***Selected specimens (from 11 examined)*: Queensland.** Moreton District: Mt Ernest, Oct 1932, *Blake* 4363A (BRI); Mt Barney, Oct 1935, *Everist* 1374 (BRI); Campbell's Folly, 4 km SW of Tylerville, Sep 1992, *Forster* PIF11510 & *Leiper* (BRI); Mt Gillies, eastern part of summit, Oct 1992, *Forster* PIF12108 & *Reilly* (BRI); Mt Ernest, Sep 1989, *Leiper* s.n. [AQ458072] (BRI); Mt Ernest, Oct 1932, *White* 8567 (BRI). **New South Wales.** Moses Rock Flora Reserve, 30 km (direct) N of Dorrigo, Apr 1994, *Bean* 7654 (BRI); Gibraltar Range NP, c. 67 km E of Glen Innes, on the Gywdir Highway, Oct 1969, *Coveny* 2214 (NSW); on North Snowy Road, Bellangry State Forest, Mar 1983, *Whaite* 4465 (NSW); Blatheram Creek area, 10 km NE of Torrington, Nov 1969, *Wissmann* s.n. [NE022850A] (NE).

***Distribution and habitat*:** *Pseudanthus pauciflorus* subsp. *pauciflorus* occurs in eastern Australia from near Rathdowney, south-east Queensland, south to Port Macquarie, New South Wales and west to Torrington. It is recorded as growing in heath, shrub-land or open eucalypt forest communities on exposed mountain tops, cliff-lines or hillsides of exposed rock pavement. The soils are generally noted as shallow sandy loams derived from granite or rhyolite substrates. **Map 9.**

***Phenology*:** Flowers have been collected in March, April and from September to November, fruits in April and November.

***Notes*:** The collections *Wissmann* [NE22850A] (NE), from Torrington, and *Bean* 7654 (BRI), from Dorrigo, differ from other collections of *P. pauciflorus* subsp. *pauciflorus* in the shape of the tepals in female flowers. These two collections have tepals that are somewhat foliose in nature with a much-reduced lamina.

***Etymology*:** The epithet is derived from the Latin, *pauci-*, few, and *-florus*, -flowered, and refers to the comparatively few flowers the species produces.

8b. Pseudanthus pauciflorus subsp. **arenicola** Halford & R.J.F.Hend. **subsp. nov.** ab *P. paucifloro* Halford & R.J.F.Hend. subsp. *paucifloro* floribus masculinis in pedicellis brevioribus (0.7–1.1 mm non 1.2–2.2 mm longis) et floribus femineis tepalis longioribus (3–4 mm non 0.5–2.9 mm longis) et latioribus (0.6–0.8 mm non usque ad 0.2 mm latis) differt. **Typus:** Queensland. Leichhardt District: Blackdown Tableland, 20 Apr 1971, *R.J. Henderson* 722 *et al.* (holo: BRI; iso: BRI, CANB, K, MEL, NSW, distribuendi)

Pseudanthus sp. (Tylerville P.I.Forster+ PIF11510) subsp. (Blackdown Tableland R.J.Henderson H722); Forster & Halford (2002, p. 73).

Leaf laminae narrowly obovate or narrowly oblong-elliptic, 4–14 mm long, 1–1.9 mm wide. Male flowers on pedicels 0.7–1.1 mm long.

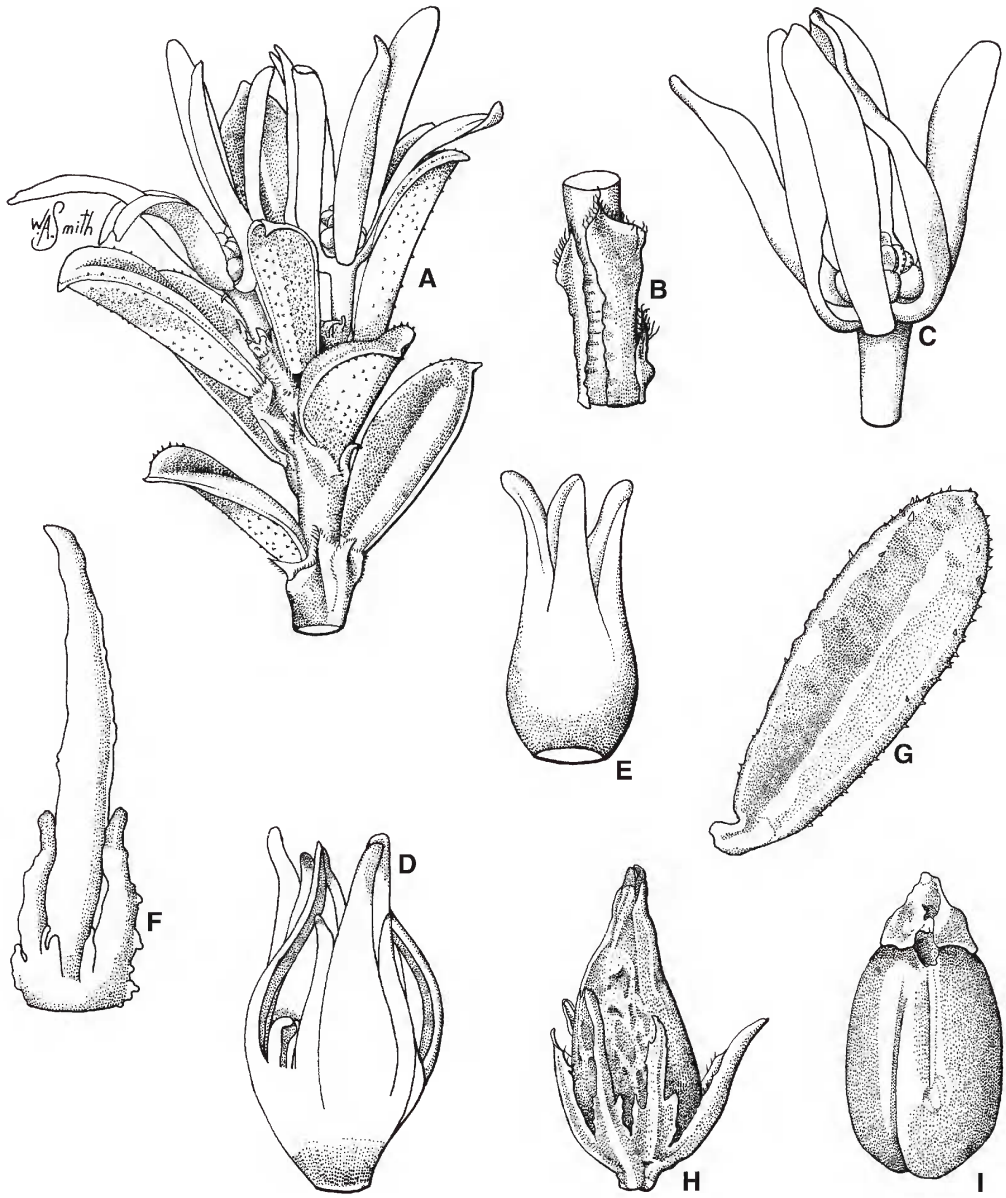


Fig. 3. ***Pseudanthus pauciflorus*** subsp. ***pauciflorus*****.** A. branchlet with flowers × 8. B. section of branchlet with leaves removed showing stipules with decurrent margin × 8. C. male flower from side × 12. D. female flower × 24. E. ovary × 24. F. tepal of female flower ×40. G. leaf × 12. ***Pseudanthus pauciflorus*** subsp. ***arenicola***. H. fruit with persistent tepals × 8. I. seed × 12. A-F from *Forster* & *Leiper* PIF11510 (BRI); G from *Halford* Q3800 (BRI); H, I from *Bean* 6936 (BRI). Del. W. Smith.

Female flowers with 6 tepals; tepals lanceolate, 3–4 mm long, 0.6–0.8 mm wide. **Fig. 3.**

***Additional specimens*: Queensland.** LEICHHARDT DISTRICT: Peregrine Lookout walking track, Blackdown Tableland, Nov 1993, *Bean* 6936 (BRI); Planet Downs pastoral holding, Apr 1998, *Brushe* JB1560 (BRI); Robinson Gorge NP, upstream section of main gorge in Get Down area, Sep 1992, *Forster* PIF11404 & *Sharpe* (BRI); Robinson Gorge, side branch upstream of Get Down, Expedition NP, Sep 1995, *Forster* PIF17780 & *Figg* (BRI); Blackdown, Aug 1961, *Gittins* 385A (BRI); Blackdown Tableland, May 1962, *Gittins* 385B (BRI, NSW); Blackdown Tableland, c. 1 km N of Horseshoe Lookout, Jan 1983, *Telford* 9179 & *Butler* (CANB).

***Distribution and habitat*:** *Pseudanthus pauciflorus* subsp. *arenicola* is restricted to central Queensland to the Blackdown Tableland near Blackwater and the Robinson Gorge (Expedition Range) near Taroom. It is recorded as growing in heath or open eucalypt forest communities on sandy soils associated with sandstone plateaux, cliff-lines or scree slopes. **Map 10.**

***Phenology*:** Flowers and fruits have been collected sporadically throughout the year.

***Etymology*:** The epithet, from Latin *arena*, sand, and *cola*, dweller, relates to the soils where plants of this subspecies are found.

Notes: The subspecies of *P. pauciflorus* are sometimes difficult to distinguish morphologically. Apart from the characters in the key above *P. pauciflorus* subsp. *arenicola* differs from *P. pauciflorus* subsp. *pauciflorus* generally in having slightly narrower and longer leaves with the leaf lamina somewhat twisted, at least when dried. They also occur in different habitats with *P. pauciflorus* subsp. *arenicola* being found on sandy soils derived from sandstone, whereas *P. pauciflorus* subsp. *pauciflorus* occurs on sandy loams derived from igneous rocks.

9. Pseudanthus pimeleoides Sieber ex Spreng., Syst. veg. 16th edn, 4(2) curae posteriores: 25 (1827). **Type:** [Australia.] in Nova Hollandia, [in 1823,] [*F.W.*] *Sieber s.n.* (holo: B (destroyed)); [Australia.] in Nova Hollandia, [in 1823], [*F.W.*] *Sieber* 292, (neo, here chosen: MEL [MEL2065874] (ex herb. Sonder); isoneo: K (ex herb. Hook.).

***Illustration*:** G. Grüning (1913: p.29, fig.6C-F).

Compact shrub to 60 cm high; stems erect, freely branching; branchlets glabrous. Leaves alternate or sometimes opposite; stipules narrowly triangular or broadly ovate, 1–1.3 mm long, red-brown becoming grey-white with age, acuminate with dark brown glandular tip, and with margin erose and irregularly toothed; decurrent margins glabrous or minutely hispidulous; petiole 0.4–1 mm long, smooth; laminae slightly to prominently concavo-convex, lanceolate or narrowly ovate, 6–13 mm long, 1–1.7 mm wide, length/width ratio 5–7:1, smooth except sometimes for minute papillae on midrib abaxially, glabrous except for minute scabrid hairs on margins; midrib obscure adaxially, prominent abaxially; tip straight or recurved, acute to attenuate with a white-coloured mucro up to 0.5 mm long; margins flat, conspicuously thickened and white-coloured. Flowers solitary in axils of upper leaves, though appearing to be in terminal clusters; bracts obovate or ovate, 1–1.3 mm long, fimbriate on margins and with short crisped hairs near tip on abaxial surface. Male flowers on pedicels (1.5–)2–5 mm long; tepals 6, slightly concavo-convex, linear or narrowly obovate, 5–12 mm long, 0.7–1.6 mm wide, creamy white coloured, erect; apex acute to obtuse; margins entire; receptacle glabrous; stamens 6, with filaments entire or slightly bifid, free, 0.3–1.4 mm long, and anthers 0.4–0.8 mm long, papillose; disc irregularly lobed. Female flowers sessile; tepals 6, lanceolate to ovate, 1.4–3 mm long, 0.5–0.8 mm wide, of unknown colour in fresh state, slightly keeled, glabrous on both surfaces; apex acuminate to obtuse sometimes with a minute reddish brown coloured glandular tip; margins irregularly toothed or fimbriate; receptacle sparsely covered with reddish brown curled hairs. Ovary trigonal-globose, c. 1 mm across, glabrous; locules 3, biovulate; styles c. 1.3 mm long, erect and recurved distally. Fruits sessile; persistent tepals > or ≤ half the length of the capsule; capsule ovoid, c. 4 mm long, c. 2.1 mm across, slightly tuberculate, glabrous, green coloured. Seeds not seen.

***Selected specimens (from c. 55 examined)*: New South Wales.** Rocky Crossing, Tahmoor, Aug 1962, *Burgess* s.n. [CBG001702] (CANB); Woronora River, 2 miles [c. 3.2 km] W of Heathcote, Aug 1956,

Constable s.n. [NSW39034] (NSW); The Pheasants Nest, Nepean River, 10 miles [c. 16 km] S of Camden, Oct 1965, *Constable* 6192 (NSW); Patonga Creek, Patonga, Mar 1960, *Constable* s.n. [MEL2065452] (MEL); above Colo River gorge, Feb 1977, *Coveny* 9119 & *Hind* (CANB, NSW); Scouter's Mt track crossing at Heathcote Creek, Heathcote NP, Sep 1983, *Coveny* 11616 & *Bishop* (NSW); The Woolwash, Campbelltown, Sep 1983, *Coveny* 11630 & *Bishop* (NSW); Nepean River at Maldon, c. 20 km SW of Campbelltown, Nov 1984, *Dunn* 584 & *James* (NSW); W tributary, Emu Creek, Wollemi NP, Mar 1984, *Floyd* 2048 (NSW); Engadine, Sep 1926, *Fuller* 291 (CANB); Woronora River, Sep 1927, *Fuller* s.n. [CANB5754] (CANB); Flat Top, Mt Hay Road, near The Pinnacles, Blue Mountains NP, Oct 1987, *Hind* 5413 & *D'Aubert* (BRI, NSW); Bargo River at end of Stratford road, Tahmoor, Nov 1987, *Hind* 5425 *et al.* (NSW); Cataract Dam, Sep 1908, *Maiden* s.n. (NSW); Picton, Sep 1891, *Maiden* s.n. (NSW); Georges River, Kentlyn, Oct 1966, *McBarron* 13349 (NSW); Woolwash, Campbelltown, Sep 1962, *McBarron* 7182 (NSW); The Elbow, George's River, Kentlyn, Aug 1966, *McBarron* 12746 (MEL, NSW); Colo Gorge at Boorai Creek-Dooli Creek junction, 24 km NW of Colo Heights, Aug 1981, *Telford* 8657 (CANB).

***Distribution and habitat*:** *Pseudanthus pimeleoides* is restricted to the Sydney region of New South Wales, from Colo Heights southwards to Bargo. It is recorded as growing on sandy soils overlying sandstone in open eucalypt forest with open heath understorey. **Map 11.**

***Phenology*:** Flowers have been collected from February to November, fruits in February, September and November.

***Typification*:** No type material of *P. pimeleoides* has been located by us. Sprengel (1827) did not cite any particular Seiber collection number in the protologue of *P. pimeleoides*. According to Stafleu and Cowan (1985), Sprengel's herbarium was passed on to his son then later dismembered and sold. The Euphorbiaceae portion was acquired by K. Mueller in Halle in 1853 then brought to Berlin in 1890. Due to action in Berlin in World War II, it is no longer extant. Selection of a neotype for *P. pimeleoides* is therefore in order. The Sieber collection 292 in MEL [MEL2065874] is here chosen as a neotype. It agrees with the protologue description.

***Notes*:** The collections *Johnson* [NSW23443] from near Musselbrook, and *Jobson* 2877 and *Webster* 18825 from Lee's Pinch (all in NSW) approach *P. pauciflorus* in leaf lamina shape but are more typical of *P. pimeleoides* in male flower size and pedicel length, and are more profusely flowering.

Excluded Name(s)

Pseudanthus tasmanicus Rodway, Pap. & Proc. Roy. Soc. Tasmania 1901: 107 (1902). **Type:** 'Among and about basalt rocks on the shores of Lake Lucy Long on the Ironstone Range and on the banks of the South Esk, near Avoca.' (holo: ?).

According to Radcliffe-Smith (1993) this name is applicable to a species of *Pseudanthus* Wight (= *Nothosaerva* Wight) in the Amaranthaceae. Type material appears non existent rendering correct placement of the name impossible at this stage. From the description, however, with respect to the nature of the ovules, it is clear that the name is not applicable to any species of *Pseudanthus* Spreng. Walsh (1996) treated it as a synonym of *Muehlenbeckea axillaris* (Hook.f.) Endl., applicable to plants in family Polygonaceae.

Taxonomy of *Stachystemon*

Stachystemon Planch., Hooker's London Journal of Botany 4: 471, t.15 (1845). **Type:** *Stachystemon vermicularis* Planch.

Pseudanthus sect. *Caletiopsis* Müll.Arg. in A. DC, Prodr. 15(2): 197 (1866). **Type:** *Pseudanthus nitidus* Müll.Arg. (= *Stachystemon virgatus* (Klotzsch) Halford & R.J.F.Hend.).

Chrysostemon Klotzsch in Lehm., Pl. Preiss. 2: 232 (1848); *Pseudanthus* sect. *Chrysostemon* (Klotzsch) Müll.Arg., Linnaea 34: 56 (1865). **Type:** *Chrysostemon virgatus* Klotzsch (= *Stachystemon virgatus* (Klotzsch) Halford & R.J.F.Hend.).

Chorizotheca Müll.Arg., Linnaea 32: 76 (1863). **Type:** *Chorizotheca micrantheodies* Müll.Arg. (= *Stachystemon virgatus* (Klotzsch) Halford & R.J.F.Hend.).

***Derivation of name*:** Named from the Greek *stachys* (ear of corn, a spike) and *stemon* (thread, stamen), in reference to the stamens being united in a long cylindrical central column (Baines 1981). This character is particularly well

developed in *Stachystemon vermicularis*, whose type is the type of the generic name.

Monoecious shrubs. Stems erect, ascending or decumbent, sparingly to much-branched; branchlets ± terete, reddish brown coloured becoming greyish white with age, mostly glabrous, rarely hispidulous, smooth or rarely papillose, ridged by decurrence of stipular margins along internodes. Leaves stipulate, petiolate, alternate, opposite or decussate, simple; stipules persistent, with margins entire or toothed, glabrous or fimbriate; laminae flat, concavo-convex or cymbiform, entire, usually conspicuously thickened along margins. Flowers solitary or few in upper leaf axils, bracteate; distal branchlet internodes often contracted to produce flower clusters at ends of branchlets with subtending leaves often reduced and bract-like. Male flowers pedicellate or rarely sessile; tepals (3 or) 4–6(–10), equal or unequal, in 2 whorls, with each whorl imbricate in bud but spreading or erect at anthesis; receptacle a hemispherical to elongated cylindrical column; stamens 7 to numerous; filaments variously fused or free, stout, mostly bifid distally; anthers of two separate (rarely adnate) contiguous cells, each transverse on the apex of the filament, dehiscing by longitudinal slits; disc absent. Female flowers sessile or rarely shortly pedicellate; tepals 4 or 6 (rarely 5), persistent, subequal, appressed to ovary (and fruit); disc absent; ovary 2(rarely 3)-celled with 2 ovules in each locule, smooth, glabrous; styles 2 (rarely 3), shortly connate or ± free, simple, persistent, spreading to erect with tip recurved. Fruit capsular, ovoid, ellipsoid or obloid and laterally compressed, 1-seeded by abortion, splitting at maturity into 2 (rarely 3) bivalved segments. Seeds subglobose, obloid or rarely ovoid, smooth, with exostomal pit obscure or well developed, carunculate; endosperm copious; cotyledons several times broader than the radicle.

A genus of 9 species endemic in south-western Western Australia.

Key to species of *Stachystemon*

1. Young branchlets with spreading unicellular hairs up to 0.8 mm long ..... **9. S. virgatus**
   Young branchlets glabrous 2

2. Tepals of male flowers all ± similar 3
   Tepals of male flowers dissimilar, either 1 or 3 inner tepals much longer than outer 3 tepals 6

3. Leaf laminae recurved distally, densely minutely papillose on upper surface; leaf margins slightly recurved; decurrent margin of stipules papillose; leaf apex acute to obtuse with mucro up to 0.6 mm long; male flowers with 4, rarely 3 tepals ..... **4. S. mucronatus**
   Leaf laminae ± plain, smooth on upper surface; leaf margins flat; decurrent margin of stipules smooth; leaf apex rounded or obtuse without mucro; male flowers with mostly 6, rarely 4 or up to 10 tepals 4

4. Capsules 6.5–7 mm long; stems sparingly branched; leaf laminae linear of linear-ovate, 4–30 mm long; midrib faintly prominent above ..... **7. S. vermicularis**
   Capsules 3.5–5.2 mm long; stems freely branching; leaf laminae obovate, narrowly elliptic to elliptic or narrowly oblong-elliptic to oblong-eliptic, 2–7 mm long; midrib obscure above; 5

5. Tepals of male flowers red; stamens ≥ 25; filaments 0.3–0.4 mm long; anthers purplish red or brown. ..... **2. S. brachyphyllus**
   Tepals of male flowers yellow; stamens 10–14; filaments > 1mm long; anthers yellow. ..... **6. S. polyandrus**

6. Leaves crowded towards the ends of branchlets; leaf laminae < 3 mm long; midrib obscure below ..... **3. S. intricatus**
   Leaves evenly spaced along branchlets; leaf laminae ≥ 3 mm long; midrib prominent below 7

7. Male flowers with one inner tepals at least 3 times longer than other two inner tepals; stamens 12–16 ..... **5. S. nematophorus**
   Male flowers with all three inner tepals ± the same length; stamens > 25 8

8. Inner tepals of male flowers ≥ 6 mm long, maroon to purplish red; outer tepals of male flowers irregularly toothed; leaf laminae acute with mucro up to 0.4 mm long ..... **8. S. vinosus**
   Inner tepals of male flowers < 6 mm long, yellow; outer tepals of male flowers entire; leaf laminae obtuse to rounded or acute ..... **1. S. axillaris**

The species are here arranged alphabetically.

1. Stachystemon axillaris A.S.George, J. Roy. Soc. Western Australia 50(4): 97 (1968, '1967'); *Pseudanthus axillaris* (A.S.George) Radcl.-Sm., Kew Bull. 48(1): 167 (1993). **Type:** Western Australia. 5 miles [c. 8 km] W of Mogumber Siding, 17 September 1965, *A.S. George* 6828 (holo: PERTH; iso: K; MEL [MEL2064482]).

***Illustration*:** A.S. George (1968, '1967': p.98, fig.1B, p.100, fig.2R–V).

Diffuse shrub to 1.2 m high; stems erect, sparingly branched; branchlets smooth, glabrous. Leaves evenly spaced along stems and branchlets, alternate; stipules narrowly triangular, 1–1.7 mm long, 0.4–0.6 mm wide, glabrous, pale brown coloured, acute to attenuate, and with margins mostly entire; decurrent margins glabrous; petioles 0.7–1.7 mm long, smooth; laminae ± flat or concavo-convex, linear to linear-oblong, (5–)10–30 mm long, 1.2–2.6 mm wide, densely minutely papillose adaxially, smooth or with scattered minute papillae abaxially, glabrous adaxially and abaxially; midrib slightly impressed or obscure adaxially, prominent abaxially; tip obtuse to rounded or acute; margins flat or sometimes slightly recurved, not prominently thickened. Flowers solitary or several in axils of upper leaves; bracts 1–3, ovate to broadly ovate, 1–1.4 mm long, glabrous, reddish brown coloured; bracteoles 1–4, similar to but smaller than bracts. Male flowers on slender pedicels 1.5–2.5 mm long; tepals 6, dissimilar with inner whorl longer than outer whorl, spreading, somewhat tumid, with margins entire; outer tepals 3, ovate or ovate-elliptic, 1–1.8 mm long, 0.8–1.3 mm wide, greenish yellow coloured, with tip rounded to obtuse or acute; inner tepals 3, linear-oblong or narrowly ovate, 1.7–3 mm long, 0.5–1 mm wide, yellow coloured, with a few simple crisped hairs proximally, with tip rounded to obtuse; receptacle hemispherical, c. 1 mm long, 1.5–2 mm diameter, glabrous; stamens 50–70, with filaments dorsi-ventrally flattened, 0.3–0.5 mm long, and anthers ellipsoid, 0.2–0.3 mm long, ± smooth, red turning brown coloured after anthesis. Female flowers on stout pedicels 0.2–0.7 mm long; tepals 6, similar; ovate, 1.5–2 mm long, 0.8–1.1 mm wide, greenish yellow coloured sometimes with a reddish flush distally, keeled, somewhat scarious, glabrous on both surfaces; apex obtuse, acute or acuminate and sometimes with a hard apiculum up to 0.5 mm long; margins erose or irregularly toothed. Ovary 0.6–0.7 mm diameter; locules 2 or rarely 3; styles 2.5–2.7 mm long, glabrous. Fruits on pedicel 0.5–0.8 mm long, ± ovoid but laterally compressed, 5–6.2 mm long, 3.7–4.5 mm wide, 2.7–3.2 mm across, smooth or somewhat rugose in dried state, glabrous. Seeds subglobose or ovoid, 4.2–4.8 mm long, 2.3–3.5 mm across; exostome pit well developed; caruncle subconical, 1.1–1.5 mm long, 1.2–1.5 mm wide.

***Selected specimens (from 14 examined)*: Western Australia.** near Arrowsmith River, Jun 1970, *Ashby* 3245 (PERTH); Reserve 31030, 18 km S of Eneabba, Mar 1981, *Blackwell* 3132 & *Griffin* (PERTH); 10 km NW of Eneabba, Mar 1981, *Blackwell* 3096 & *Griffin* (PERTH); 2 miles [c. 3 km] NNE of Yeal Swamp in Wanneroo, Jan 1965, *Chadwick* 2564 (PERTH); Three Springs-Coorow Road, Sep 1970, *Chapman* s.n. (PERTH); S.E.C. access road, 25 km S of Eneabba on

Brand Highway, Jul 1981, *Cranfield* 1686 (PERTH); c. 4 km S of Eneabba Railway Station, Oct 1982, *Demarz* 9373 (PERTH); 4 miles [c. 6 km] S of Cockleshell Gully, Sep 1966, *George* 7814 (PERTH); 8 km S of Eneabbba, Sep 1977, *Hnatiuk* 771186 (PERTH); c. 4 km SE of Kalbarri, May 1968, *Wilson* s.n. (PERTH).

***Distribution and habitat*:** *Stachystemon axillaris* occurs in scattered localities in an area of Western Australia bounded by Kalbarri National Park, Three Springs, Moora and Wanneroo. It is recorded as growing on sandplains in low open heath or low open woodland dominated by *Eucalyptus todtiana* on grey or white sand, often with lateritic gravel overlying laterite. **Map 12.**

***Phenology*:** Flowers have been collected from February to October, fruits in September and October.

***Notes*:** The conservation status of *Stachystemon axillaris* is given as Priority 4 (Western Australian Herbarium 1998-2003) under the Western Australian Flora Conservation Codes.

2. **Stachystemon brachyphyllus** Müll.Arg., Linnaea 32: 76 (1863), as 'brachyphyllum'. *Pseudanthus brachyphyllus* (Müll.Arg.) F.Muell., Syst. Census Austral. pl.1: 18 (1882). **Type:** [Western Australia.] Swan River, [without date,] [*J.*] *Drummond* 95 (holo: G-DC *n.v.*, microfiche IDC 800–73. 2454: I. 7); iso: BRI [AQ403982], K, PERTH).

Diffuse to compact shrub to 70 cm high; stems erect, much-branched distally; branchlets smooth, glabrous. Leaves evenly spaced along stems and branchlets, alternate; stipules narrowly triangular to triangular, 0.5–1.7 mm long, 0.3–0.4 mm wide, glabrous except for a few hairs adaxially, red-brown becoming grey-white coloured with age, attenuate, and with margins entire, glabrous or sparsely fimbriate; decurrent margins glabrous; petioles 0.3–0.5 mm long, smooth or rugulose; laminae concavo-convex or rarely cymbiform, narrowly elliptic to elliptic or narrowly oblong-elliptic to oblong-elliptic, 3.2–6.7 mm long, 1.1–1.9 mm wide, glabrous and smooth on adaxial surface, smooth except for minute papillae on margin and along midline of abaxial surface, glabrous or rarely with scattered minute hairs on abaxial surface; midrib obscure adaxially, prominent abaxially; tip obtuse; margins flat, thickened but not obviously so. Flowers solitary in axils of upper leaves, grouped into terminal clusters, often with subtending leaves reduced and bract-like; bracts triangular, 0.5–0.8 mm long, with a few hairs on adaxial surface and along margin, reddish brown coloured; bracteoles 2, similar to but smaller than bracts. Male flowers on stout, tapered pedicels 1.5–3.5 mm long; tepals 6(10), ± similar, slightly concavo-convex, narrowly oblong to narrowly ovate, 1.7–3.3 mm long, 0.5–1 mm wide, scarious or somewhat tumid, red coloured, spreading, with tip acute, and margins entire or irregularly toothed; receptacle cylindrical, 1.5–8.5 mm long, 0.5–1.5 mm diameter, glabrous; stamens 25 to numerous, with filaments dorsi-ventrally flattened or irregularly shaped, tumid and 0.3–0.4 mm long, and anthers obloid, 0.4–0.5 mm long, smooth or papillose, purplish red or brown coloured. Female flowers subsessile; tepals 6, ± similar or those of the inner whorl slightly smaller, ovate or broadly obovate to suborbicular, 2–4.1 mm long, 1.5–1.9 mm wide, yellow with reddish tips, keeled, scarious, glabrous on both surfaces except for a few hairs on midline of adaxial surface; apex acuminate or obtuse to rounded with a hard apiculum up to 0.5 mm; margins irregularly toothed, erose or minutely fimbriate. Ovary 0.5–1.2 mm diameter; locules 2; styles 3.5–5.5 mm long, glabrous. Fruits ± sessile, ± ovoid but laterally compressed, 4.7–5 mm long, 3.5–3.8 mm diameter, 3–3.5 mm across, smooth or somewhat rugose in dried state, glabrous. Seeds subglobose, 3–3.7 mm long, 2.3–3 mm across; exostome pit poorly or well developed; caruncle subconical, 0.8–1.1 mm long, 0.8–1 mm wide.

***Additional specimens*:** **Western Australia.** near Narembeen, 72 km S of Merredin, Sep 1929, *Blackall* s.n. (PERTH); 33 km E of Forrestonia crossroads or 118 km E of Hyden on northern side of road to Norseman, Oct 1984, *Brown* 211 (PERTH); Wyalkatchem, Jun 1922, *Gardner* s.n. (PERTH); Wyalkatchem, Jun 1922, *Gardner* 1705 (PERTH); on small reserve W of Manmanning, Dec 1974, *George* 12928 (BRI, PERTH); without locality, Aug 1980, *George* 15906 (PERTH); Moora, Jan 1978, *Haberley* s.n. (PERTH); 23 km NE of Mt Heywood, Nov 1980, *Newbey* 7966 (PERTH); 84.4 miles [c. 136 km] N of Perth, between Bolgart and Calengiri, Sep 1971, *Paust* 1007 (PERTH); 5 miles [c. 8 km] W of Manmanning, Sep 1984, *Smith* 444 (MEL, PERTH); 3 km NW of

Wongan Hills between road to Piawaning and railway line, Sep 1983, *Taylor* 2163 & *Ollerenshaw* (CANB).

***Distribution and habitat*:** *Stachystemon brachyphyllus* occurs from near Wongan Hills south-eastward to Mt Heywood and Mt Ragged near Esperance in Western Australia. It is recorded as growing in heath, open shrub mallee or low woodland communities with dense shrub understorey, on deep sandy soils sometimes overlying lateritic rocks. **Map 13.**

***Phenology*:** Flowers have been collected from June to January, fruits from August to January.

***Notes*:** A number of intermediates between *S. brachyphyllus* and *S. polyandrus* have been observed, e.g. as represented by *Beard* 5266 (PERTH), *Wittwer* W1874 (PERTH), *Hnatuik* 761262 (PERTH), *Brown* 103 (PERTH) and *Pignatti* 1165 (PERTH). In these specimens, the leaves are shorter and more elliptic than is typical for *S. brachyphyllus*. As well, the leaf axils are generally more hairy and the stipules broader than is typical in *S. brachyphyllus*. They differ from typical *S. polyandrus* in having shorter staminal filaments, and calyx lobes and staminal filaments that are dark reddish maroon coloured as compared with yellow to white colouration typical of *S. polyandrus*.

3. Stachystemon intricatus Halford & R.J.F.Hend., **sp. nov.** ab speciebus *Stachystemonis* Planch. ceteris omnibus caulibus dense et intricate ramosis, et foliis parvis (laminis 1.4–2.5 mm longis) ad extremum ramulorum confertis facile distinguibilis. **Typus:** Western Australia. 5 km S of Paynes Find, 7 August 1969, *P.G. Wilson* 8627 (holo: PERTH; iso: PERTH).

Pseudanthus intricatus C.A.Gardner ms, Paczkowska & Chapman (2000).

Compact shrub to 30 cm high; stems ascending to erect, densely and intricately branched; branchlets smooth, glabrous. Leaves crowded towards the ends of branchlets, decussate or subopposite on elongating shoots; stipules narrowly triangular, 0.6–0.8 mm long, 0.1–0.2 mm wide, glabrous abaxially, sparsely to densely pubescent adaxially, red-brown becoming grey coloured with age, attenuate and with margins erose or fimbriate; decurrent margins glabrous; petioles 0.3–0.5 mm long, smooth; laminae concavo-convex or somewhat cymbiform, obovate or elliptic, 1.4–2.5 mm long, 0.6–1.5 mm wide, smooth or with scattered papillae on margins adaxially, smooth abaxially, glabrous adaxially and abaxially; midrib obscure adaxially and abaxially; tip rounded, sometimes with a minute white-coloured apiculum; margins flat, conspicuously thickened. Flowers solitary in axils of upper leaves, grouped into terminal clusters, sometimes with subtending leaves reduced and bract-like; bracts ovate, 0.6–0.8 mm long, with crisped hairs on adaxial surface and on margins, reddish brown coloured; bracteoles 1 or 2, similar to but smaller than bracts. Male flowers sessile or shortly pedicellate with pedicels 0.5–0.6 mm long, stout and tapered; tepals 6, dissimilar with inner whorl longer than outer whorl, spreading, somewhat tumid, with margins entire; outer tepals 3, broadly obovate to suborbicular, 1.3–1.4 mm long, 1.1–1.4 mm wide, cupular, white coloured, with tip rounded to obtuse; inner tepals 3, narrowly obovate to obovate, 2.1–4 mm long, 0.9–1.5 mm wide, ± flat, white coloured though sometimes with pinkish blush, with tip rounded; receptacle cylindrical, 0.5–0.6 mm long, 0.4–0.5 mm diameter, glabrous; stamens 23–27, with filaments dorsi-ventrally flattened, 0.2–0.6 mm long, and anthers ellipsoid, 0.2–0.4 mm long, smooth, of unknown colour. Female flowers sessile; tepals (5 or) 6, ± dissimilar, scarious, concave, not keeled, glabrous on both surfaces, white coloured; outer tepals 3, narrowly ovate to ovate, 1.3–1.7 mm long, 0.8–1 mm wide, with acute to obtuse tip and erose or irregularly toothed margins; inner tepals (2 or) 3, broadly ovate to suborbicular, 0.9–1.3 mm long, 0.6–0.9 mm wide, with obtuse to rounded tip and ± entire margins; receptacle glabrous. Ovary 0.6–0.7 mm diameter; locules 2; styles 1.6–2.3 mm long, glabrous. Fruits sessile, obloid, 6–7 mm long, 2.5–2.7 mm diameter, 3.2–3.7 mm across, smooth or rugose in dried state, glabrous. Seeds not seen. **Fig. 4**

***Additional specimens*:** **Western Australia.** Lake Monger, Jul 1959, *Aplin* 550 (PERTH); Kirkalocka Station, 7 miles [c. 11 km] E of homestead, Sep 1973, *Beard* 6660 (NSW, PERTH); Butcher's Track, E of Meadow Station, Oct 1973, *Beard* 6827 (NSW, PERTH); 3 miles [c. 5 km] N of Paynes Find, Jul 1931, *Blackall* 35 (PERTH); proposed Toolonga Nature Reserve, Sep 1978, *Burbidge* 38 (PERTH); 2.3 km WNW of Wealbarguntha Hill, Koonmarra Station, Aug 1986, *Cranfield* 6013 (PERTH); 2.3 km WNW of

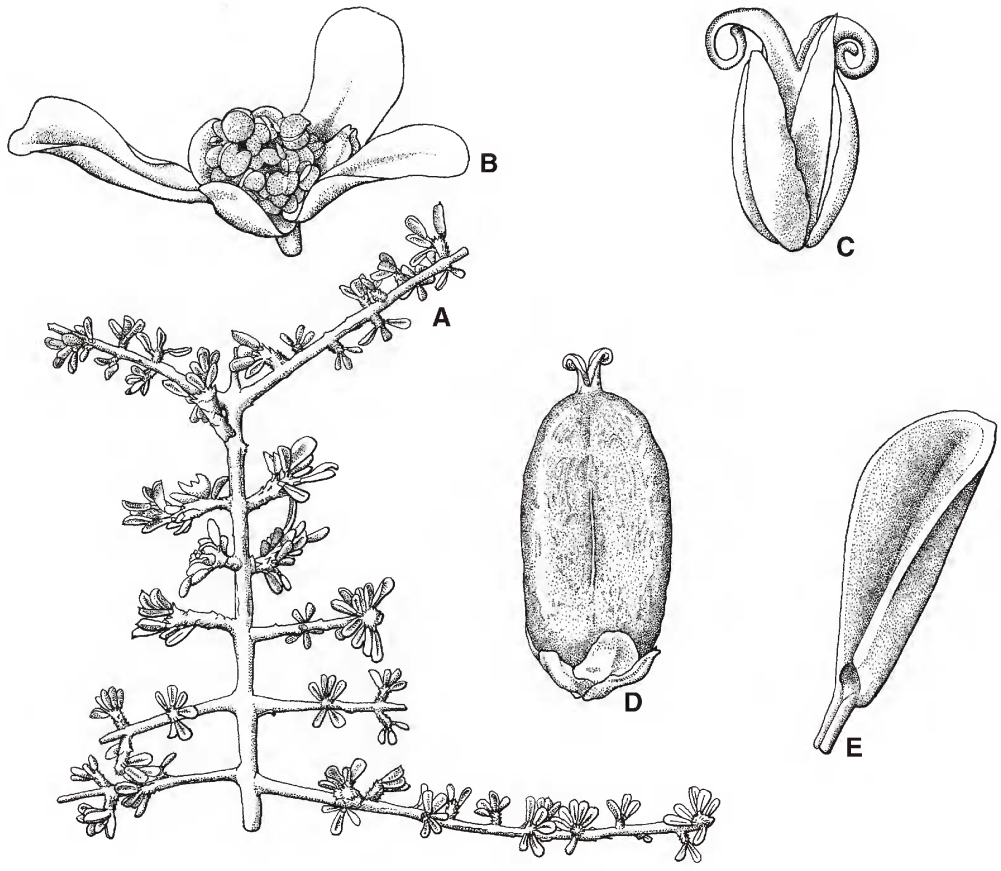


Fig. 4. ***Stachystemon intricatus***. A. branchlet with flowers ×2. B. male flower from side ×10. C. female flower ×14. D. fruit ×6. E. leaf ×20. A-E from *Beard* 6827 (PERTH). Del. W. Smith.

Wealbarguntha Hill, Koonmarra Station, Aug 1986, *Cranfield* 6002 (PERTH); 287 mile peg on Paynes Find – Mt Magnet road, Jul 1966, *Fairall* 1803 (PERTH); Paynes Find, Jul 1931, *Gardner* 2225 (PERTH); between Meeberrie and Hamlin Pool, Aug [1931], *Gardner* 2538 (PERTH); 5 km S of Paynes Find, Aug 1969, *Wilson* 8627 (PERTH).

Distribution and habitat: *Stachystemon intricatus* occurs in an area of Western Australia more or less bounded by Hamelin Pool, Meekatharra and Paynes Find. It is recorded as growing on breakaways in shrubland on white-red sandy clay over laterite, and on sand plains in mulga on red sandy soils. **Map 14.**

Phenology: Flowers have been collected from July to October, fruits in October.

Affinities: *S. intricatus* is easily distinguished from other species of *Stachystemon* by its dense and intricately branched stems, and its small leaves crowded at the ends of the branchlets.

Etymology: The specific epithet is from Latin *intricatus*, entangled, a reference to the branching pattern of plants of this species.

4. Stachystemon mucronatus Halford & R.J.F.Hend., **sp. nov.** arte affinis *S. virgato* (Klotzsch) Halford & R.J.F.Hend. sed caulis ramulis glabris et papillosis, stipulis longioribus (1.2–3 mm non 0.9–1.6 mm longis), pagina adaxiali laminae foliorum minute papillosa non laevi et mucrone laminae foliorum longiore (ad 0.6 mm longo non minuto, si praesenti) et plus prominenti differt. **Typus:** Western

Australia. c. 48 km ESE of Ravensthorpe, on road to Esperance, 20 Sep 1988, *R.J.F. Henderson* H3186 (holo: BRI; iso: MEL, PERTH, distribuendi).

Compact shrub to 80 cm high; stems ascending to erect, much-branched; branchlets papillose, glabrous. Leaves evenly spaced along stems and branchlets, alternate or sometimes decussate; stipules narrowly triangular, 1.2–3 mm long, 0.3–0.7 mm wide, red-brown becoming grey coloured with age, glabrous, attenuate with a dark brown gland at tip, and with margins entire or irregularly toothed; decurrent margins papillose; petioles 0.6–0.8 mm long, smooth; laminae concavo-convex, narrowly oblong to narrowly oblong-elliptic or narrowly elliptic, 2.7–10.2 mm long, 1.2–2.5 mm wide, densely minutely papillose adaxially, sparsely minutely papillose abaxially, glabrous adaxially and abaxially; midrib

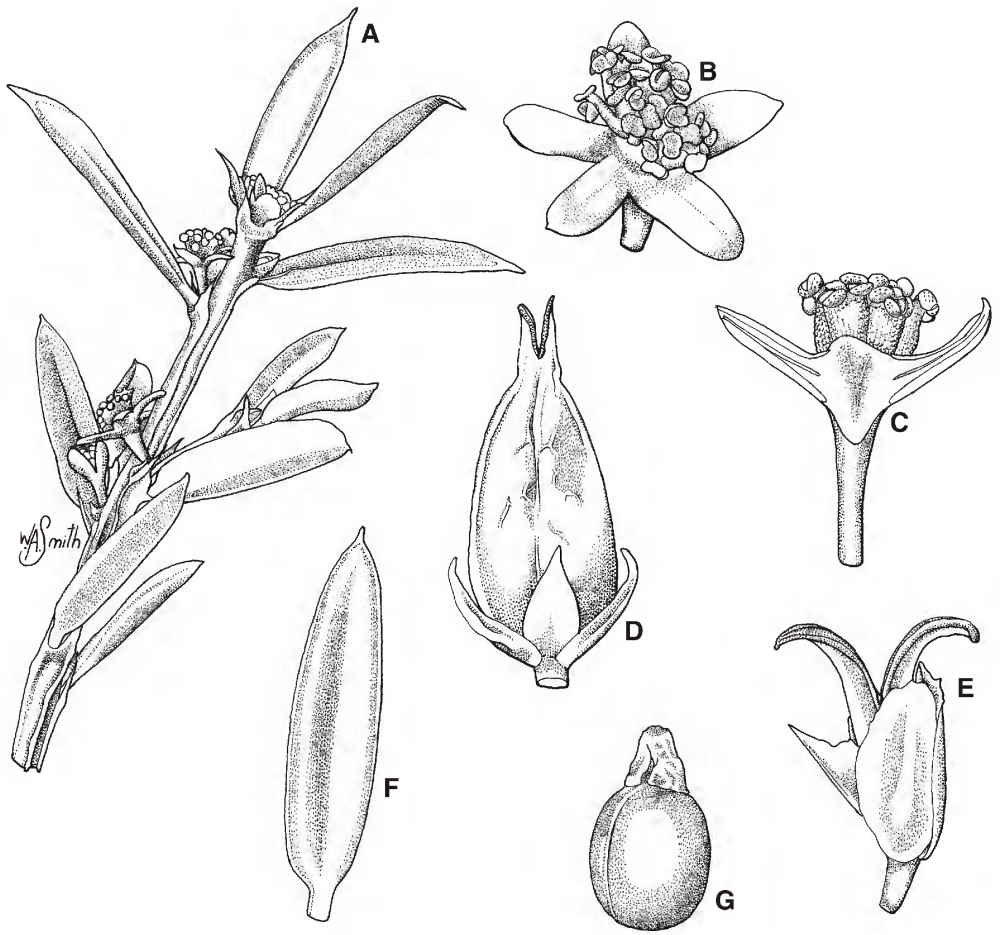


Fig. 5. ***Stachystemon mucronatus.*** A. branchlet with flowers × 4. B. male flower from side × 12. C. longitudinal section of male flower × 12. D. fruit ×6. E. female flower × 12. F. leaf × 6. G. seed × 8. A-F from *Henderson* 3186 (BRI); G from *Jobson* 2635 (BRI). Del. W. Smith.

obscure adaxially, prominent abaxially; tip recurved, acute to obtuse with a white-coloured mucro up to 0.6 mm long; margins slightly recurved, prominently thickened. Flowers solitary in axils of upper leaves, grouped into terminal clusters with subtending leaves sometimes reduced and bract-like; bracts ovate, 1.3–1.6 mm long, glabrous, reddish brown coloured, toothed distally; bracteoles absent or up to 2, similar to but smaller than bracts. Male flowers on slender pedicels 0.5–0.8 mm long; tepals (3)4(or 5), similar, convex, broadly ovate, 1–1.7 mm long, 0.8–1.5 mm wide, somewhat tumid, greenish yellow coloured, spreading, with apex acute to obtuse, and margins entire or slightly erose; receptacle hemispherical, c. 0.4 mm long and c. 1 mm diameter, with a few minute hairs; stamens 7–15, with filaments dorsi-ventrally flattened, 0.5–0.9 mm long, and anthers ellipsoid, 0.2–0.4 mm long, smooth, yellow coloured. Female flowers sessile or shortly pedicellate with pedicels stout, up to 0.5 mm long; tepals 4(5 or 6), ± similar, narrowly ovate to ovate, 1.9–3 mm long; 0.7–1 mm wide, yellowish coloured, prominently keeled, scarious, glabrous on both surfaces; apex acuminate or acute; margins irregularly toothed or lobed. Ovary 0.5–0.6 mm diameter; locules 2; styles 1.8–2.5 mm long, glabrous or sparsely papillose proximally. Fruits sessile, ± ovoid but laterally compressed, 5–7 mm long, 2.2–3 mm wide, 2.2–2.7 mm across, ± smooth, glabrous. Seeds subglobose, 2.4–2.5 mm long, 2.1–2.5 mm wide; exostome pit absent or if present then not well developed; caruncle subconical, 1–1.5 mm long, 0.6–1.1 mm wide. **Fig. 5.**

***Selected specimens (from 16 examined)*: Western Australia.** Thumb Peak range, SW of Ravensthorpe, Oct 1965, *George* 7148 (PERTH); Mt Maxwell, 40 km (by road) N of Bremer Bay, Oct 1993, *Jobson* 2635 (BRI); on southern face of East Mt Barren, Oct 1970, *Maslin* 948 (PERTH); upper southern slopes of East Mt Barren, Oct 1966, *Muir* 4167 (MEL); East Mt Barren, Oct 1985, *Pignattii* 1433 (PERTH); slopes of Mt Maxwell, Nov 1985, *Powell* 3328 (NSW, PERTH); Mt Maxwell, west end of Fitzgerald River NP, Sep 1992, *Robinson* 936 (BRI); Fitzgerald River Reserve, Jul 1970, *Royce* 8915 (PERTH); Thumb Peak, Fitzgerald River NP, Oct 1970, *Royce* 9272 (PERTH); near Middle Mt Barren, Fitzgerald River NP, May 1970, *Wilson* 10155 (PERTH); East Mt Barren, c. 8 km W of Hopetoun, Oct 1966, *Wilson* 5456 (PERTH); East Mt Barren, Apr 1974, *Wittwer* W1193 (PERTH); East Mt Barren, Aug 1965, *Wittwer* 363 (PERTH).

***Distribution and habitat*:** *Stachystemon mucronatus* has been recorded from a number of peaks in the Fitzgerald River National Park and from one locality near the Oldfield River between Ravensthorpe and Esperance in Western Australia. It is recorded as growing on mountain and hill tops in *Banksia* heathland on white sandy soils with quartz stones, and on plains in shrubland communities on grey sandy loam soils. **Map 15.**

***Phenology*:** Flowers have been collected in April and from August to November, fruits in September and October.

***Affinities*:** *Stachystemon mucronatus* is most closely related to *S. virgatus* but can be distinguished from that by its glabrous papillose branchlets, generally longer stipules (1.2–3 mm long as compared with 0.9–1.6 mm long), minutely papillose adaxial surface of the leaf lamina, and longer and more prominent mucro on the leaf lamina apex.

***Etymology*:** The specific epithet is from Latin *mucronatus*, possessing a hard sharp point, a reference to conspicuous mucro at the apex of leaves of this species.

5. Stachystemon nematophorus (F.Muell.) Halford & R.J.F.Hend., **comb. nov.**

Pseudanthus nematophorus F.Muell., Fragm. 2: 4 (1860). **Type:** [Western Australia.] Murchison River, [without date,] [*A.F.*] *Oldfield* s.n. (holo: MEL [MEL98606]; iso: MEL [MEL2062906] (ex herb. Sonder)).

***Illustration*:** S.D. Hopper *et al.* (1990: p. 88).

Compact shrub to 10 cm high; stems ascending to erect, much-branched; branchlets, smooth, glabrous. Leaves evenly spaced along stems and branchlets, decussate; stipules narrowly triangular, 0.7–1.2 mm long, 0.2–0.3 mm wide, glabrous, pale brown coloured, acute with a red gland at tip, and with margins entire or minutely toothed; decurrent margins glabrous; petioles 0.6–0.8 mm long, smooth; laminae concavo-convex, linear to linear-oblong, 4–15 mm long, 0.9–1.5 mm wide, minutely papillose adaxially, smooth except for minute papillae on midrib abaxially, glabrous adaxially and abaxially; midrib obscure adaxially, prominent abaxially; tip acute with white-coloured mucro c. 0.2 mm long;

margins flat, conspicuously thickened. Flowers solitary in axils of upper leaves, grouped into terminal clusters with subtending leaves sometimes reduced and bract-like; bracts triangular, up to 0.2 mm long, glabrous, reddish brown coloured; bracteoles 2, similar to but smaller than bracts. Male flowers ± sessile; tepals 6, dissimilar, spreading, tumid, ± flat or slightly convex, with margins entire; outer tepals 3, broadly ovate or oblong to oblong-ovate, 0.5–0.9 mm long, 0.6–0.8 mm wide, of unknown colour when fresh; with rounded to obtuse tip; inner tepals 3 with two slightly shorter and one much longer than outer tepals, of unknown colour when fresh; shorter tepals broadly ovate, 0.6–0.7 mm long, 0.5–0.6 mm wide, with rounded to obtuse tip; longer tepal filiform, 2.5–2.7 mm long, 0.1–0.2 mm wide, with glandular tip; receptacle slightly convex, c. 0.2 mm long, 0.5–0.6 mm diameter, glabrous; stamens 12–16, with filaments dorsi-ventrally flattened, 0.4–0.6 mm long, and anthers obloid, 0.2–0.3 mm long, ± smooth, of unknown colour. Female flowers sessile; tepals 6, ± similar, ovate; 0.6–1.2 mm long, 0.2–0.5 mm wide, of unknown colour, keeled, somewhat tumid, glabrous on both surfaces; apex acute to obtuse sometimes with a brown glandular tip; margins irregularly toothed. Ovary 0.4–0.5 mm diameter; locules 2; styles 0.5–0.9 mm long, glabrous. Fruits sessile, ovoid, 5–7 mm long, 2–3 mm across, smooth or somewhat rugose in dried state, glabrous. Seeds obloid, 3–3.5 mm long, 1.8–1.9 mm wide, 1.7–2.2 mm across; exostome pit well develop; caruncle subconical, c. 0.8 mm long, c. 1 mm wide.

***Additional specimens*:** Western Australia. [without specific locality], in 1854, *Drummond* 89 (PERTH); Red Bluff, c. 5 km S of Kalbarri township, Sep 1988, *Henderson* H3147 (BRI); Kalbarri NP, c. 0.5 km S of Z bend, May 1968, *Wilson* 6751 (PERTH).

***Distribution and habitat*:** *Stachystemon nematophorus* is known only from the Kalbarri National Park north of Geraldton in Western Australia. It is recorded as growing on rocky pavement in low shrubland on sandy soils in rock crevices. **Map 16.**

***Phenology*:** Flowers have been collected in May, fruits in September.

***Notes*:** When in flower, *Stachystemon nematophorus* is not easily confused with any other species of *Stachystemon* because of the single elongated inner tepal in the male flowers.

The conservation status of *Stachystemon nematophorus* is given as Declared Rare Flora (Western Australian Herbarium 1998-2003) under the Western Australian Flora Conservation Codes.

6. Stachystemon polyandrus (F.Muell.) Benth., Fl. Austral. 6: 62 (1873); *Pseudanthus polyandrus* F.Muell., Fragm. 2: 153 (1861). **Type:** Western Australia. Oldfield River, [without date,] [*G.*] *Maxwell* s.n. (lecto: MEL [MEL2065950]; iso: K).

Pseudanthus chryseus Müll.Arg., Flora 47(31): 486 (1864). **Type:** [Western Australia.] Swan River, [without date,] [*J.*] *Drummond* 221 (holo: K; iso: BRI [AQ403983], MEL [MEL2062938], PERTH).

***Illustration*:** M.G. Corrick & B.A. Fuhrer (1996: p.55).

Diffuse to straggling shrub to 50 cm high; stems ascending to erect, much-branched; branchlets smooth, glabrous. Leaves ± crowded towards the ends of branchlets, alternate or sometimes decussate; stipules narrowly triangular, 0.5–0.9 mm long, 0.2–0.3 mm wide, glabrous abaxially, pubescent adaxially, red-brown becoming grey coloured with age, attenuate, and with margins fimbriate; decurrent margins glabrous; petioles 0.4–0.7 mm long, papillose or wrinkled; laminae concave or somewhat cymbiform, obovate, oblong-elliptic or elliptic, 2–4 mm long, 1.1–1.4 mm wide, smooth except for minute papillae on margins and glabrous except for scattered minute hairs on margins adaxially, minutely papillose and glabrous or sparsely hispidulous abaxially; midrib obscure adaxially, prominent abaxially; tip rounded; margins flat, thickened but not obviously so. Flowers solitary in axils of upper leaves, grouped into terminal clusters often with subtending leaves reduced and bract-like; bracts triangular, 1–1.9 mm long, with curled hairs on adaxial surface and fimbriate margins, reddish brown coloured; bracteoles 1 or 2, similar to but smaller than bracts. Male flowers on stout, tapered pedicels 1–2 mm long; tepals 4–6, similar, concavo-convex, narrowly ovate, 1.5–2.5 mm long, 0.5–0.8 mm wide, somewhat tumid, erect, yellow coloured, with apex acute and margins entire; receptacle cylindrical, 0.5–

2 mm long, 0.6–0.7 mm diameter, glabrous or with simple hairs up to 0.3 mm long; stamens 10–14, with filaments of uneven length, subterete or dorsi-ventrally flattened sometimes tumid distally, 1.3–3 mm long, and anthers ellipsoid, 0.4–0.7 mm long, smooth, yellow coloured. Female flowers sessile; tepals 6, ± similar or inner whorl slightly smaller, narrowly ovate to ovate, 2–3.2 mm long, 1–1.5 mm wide, yellow to white coloured, prominently keeled, scarious, glabrous on abaxial surface, villose or pubescent on adaxial surface; apex acute or acuminate with a hard apiculum up to 0.3 mm long; margins fimbriate. Ovary 0.6–0.7 mm diameter; locules 2; styles 2.7–3.1 mm long, glabrous. Fruits sessile, ± ovoid, laterally compressed, 3.5–5.2 mm long, mm 3.3–3.5 wide, 3.1–3.9 mm across, smooth or slightly rugose in dried state, glabrous. Seeds subglobose, 3.2–3.7 mm long, 3–3.4 mm across; exostome pit well developed but not prominent; caruncle irregularly shaped, c. 0.8 mm long, c. 1 mm wide.

***Selected specimens (from 42 examined)*: Western Australia.** along track S of Jerramungup - Ravensthorpe road, along No.2 Rabbit-proof Fence, c. 13 km in toward Twertup Quarry, Nov 1968, *Canning* WA/68 7502 (CANB, PERTH); c. 48 km ESE of Ravensthorpe, on road to Esperance, Sep 1988, *Henderson* H3187 (BRI); Phillips River, Sep 1962, *Cough* 32 (PERTH); Hopkins Nature Reserve No.35134, 15 km SE [of] Kulin, Oct 1984, *Brown* 113 (PERTH); No Tree Hill area, near Fitzgerald River Reserve, Oct 1970, *Maslin* 976 (PERTH); 16 miles [c. 26 km] E of Lake Grace, Oct 1963, *Newbey* 1023 (PERTH); c. 35 km NNW of Young River crossing on Ravensthorpe-Esperance main road, Oct 1968, *Jackson* 1418 (AD, PERTH); c. 14 km E of the mouth of the Oldfield River, Oct 1969, *Orchard* 1497 (AD, PERTH); near Pallarup Rocks, Lake King - Ravensthorpe road, Oct 1960, *George* 1651 (PERTH); 22.7 km SE of Muckinwobert Rock, Oct 1983, *Burgman* 2716 & *McNee* (PERTH); West Mt Barren, Oct 1963, *Aplin* 2766 (MEL, PERTH); No.2 Rabbit-proof Fence, 1 mile [c. 2 km] SE of Albany-Esperance road, Oct 1966, *Muir* 4104 (MEL); Fitzgerald River NP, 7 km SW of Annie Peak, Jan 1979, *Crisp* 5023 (CANB); 22 miles [c. 35 km] W of West River, Jan 1974, *Demarz* 5040 (PERTH); 34 km from Hopetoun along Ravensthorpe road, Sep 1983, *Purdie* 5390 (CANB); c. 62 km W of Ravensthorpe on Ongerup Road, Oct 1966, *Wilson* 5412B (PERTH); 25 miles [c. 40 km] W of Bremer Bay, Oct 1965, *George* 6936 (PERTH); Thumb Peak Range, Oct 1965, *George* 7136 (PERTH); 25 km N of Esperance - Ravensthorpe Road, Sep 1968, *Wilson* 7922 (PERTH); 17 km from Newdegate along road to Lake King, Oct 1982, *Strid* 21090 (K, PERTH).

***Distribution and habitat*:** *Stachystemon polyandrus* occurs from near Kulin southwards to Fitzgerald River National Park and east to Israelite Bay in south-western Western Australia. It is recorded as growing on plains and gentle hillslopes, in shrubland with scattered mallee on grey sandy loam or white sand over gravel, and in heathland sometimes with scattered mallees on white to yellow sand or brown sandy gravel over laterite; it is also found growing on rocky ridges in heathland on skeletal sand soils over quartzite rocks and on coastal sand dunes in heathland on well-drained deep sandy soils. **Map 17.**

***Phenology*:** Flowers have been collected in June and from September to January, fruits from September to November.

***Typification*:** In the protologue of *Pseudanthus polyandrus*, Mueller (1861) cited "In Nova Hollandia austro-occidentali promontorium Cape le Grand versus, Maxw. [G. Maxwell]". In MEL there are two Maxwell specimens from south-western Australia (MEL2065950 and MEL2065951). Both are without a collection date, but both are labelled *Pseudanthus polyandrus* in Mueller's hand. The material on these sheets agrees with the description in the protologue and it is, therefore, considered to be type material. Sheet MEL2065950 is chosen as the lectotype for *Pseudanthus polyandrus* because it is the more ample specimen.

7. Stachystemon vermicularis Planch., London J. Bot. 4: 471, t.15 (1845) as 'vermiculare'; *Pseudanthus vermicularis* (Planch.) F.Muell., Syst. Census Austral. pl. 1: 18 (1882). **Type:** [Western Australia.] Swan River, [without date,] [*J.*] *Drummond* s.n. (lecto, here chosen: K (specimen on far right of sheet (ex herb. Hook.)).

***Illustrations*:** J.E. Planchon (1845: t.15); G. Grüning (1913: p. 34, fig.7).

Diffuse, glabrous shrub to 1 m high; stems erect, sparingly branched; branchlets smooth, glabrous. Leaves evenly spaced along stems and branchlets, alternate; stipules narrowly triangular, 1.1–1.5 mm long, 0.2–0.4 mm wide, glabrous except for a few simple hairs adaxially, pale brown becoming grey coloured with age, attenuate with red-brown gland at tip, and with margins entire; decurrent margins glabrous; petioles 0.6–1.2 mm long, smooth; laminae flat

or slightly concavo-convex, linear or linear-ovate, 4.5–30 mm long, 1–1.3 mm wide, smooth except for minute papillae on margins, glabrous adaxially and abaxially; midrib slightly prominent adaxially, prominent abaxially; tip acute or obtuse; margins flat, not prominently thickened. Flowers solitary in axils of upper leaves, grouped into terminal clusters with subtending leaves sometimes reduced and bract-like; bracts triangular to subulate, 1.7–2.2 mm long, with a few cilia on margin, reddish brown coloured; bracteoles 1 or 2, similar to but smaller than bracts. Male flowers on stout, tapered pedicels 1.5–1.6 mm long; tepals 6, ± similar, ± flat, linear-ovate to ovate, 1.5–2 mm long, 0.3–0.7 mm wide, scarious, red coloured, erect, with apex acute and margins entire or sparsely minutely toothed; receptacle cylindrical, 6–20 mm long, 0.9 mm diameter, glabrous; stamens numerous, with filaments irregularly-shaped, tumid, 0.2–0.5 mm long, and anthers ellipsoid, 0.3–0.6 mm long, papillose, purplish red coloured. Female flowers sessile or shortly pedicellate on slender pedicels up to 0.5 mm long; tepals 5 or 6, ± similar or inner whorl slightly smaller, narrowly ovate to ovate, 2–4.8 mm long, 0.6–2.1 mm wide, yellowish coloured, keeled, scarious, glabrous; apex acuminate with hard apiculum up to 0.2 mm long; margins erose or irregularly toothed. Ovary 0.6–0.9 mm diameter; locules 2; styles 3.2–5.1 mm long, glabrous. Fruits ± sessile, ± ovoid but a little laterally compressed, 6.5–7 mm long, 3.5–4.5 mm across, smooth or slightly rugose in dried state, glabrous. Seeds subglobose, 3.3–4.7 mm long, 2.7–3.6 mm across; exostome pit well developed; caruncle subconical, 1.1–1.3 mm long, 1–1.2 mm wide.

***Selected specimens (from 23 examined)*: Western Australia.** 5 km from Collie along road to Mumballup, Jan 1979, *Barnsley* 825 (CANB); Jarrah Road, South Perth, Feb 1981, *Cranfield* R403 (PERTH); Gosnells, Nov 1975, *Demarz* 5842 (PERTH); Jarrahdale, Jan 1900, *Fitzgerald* s.n. (PERTH); Mundijong, Jan 1924, *Gardner* 2082 (PERTH); Mundijong, Jan 1924, *Gardner* 1582 (PERTH); Armadale, Nov 1920, *Gardner* s.n. (PERTH); 1 mile [c. 1.6 km] S of Yarloop, Apr 1966, *George* 7727 (PERTH); Dwellingup, Sep 1982, *Keighery* 5212 (PERTH); Yarloop, Oct 1983, *Keighery* 6357 (PERTH); 8 km E of Waroona, Jul 1983, *Keighery* 6164 (PERTH); Collie basin, Dec 1980, *Koch* CJK175 (PERTH); Armadale, Nov 1922, *Koch* 2681 (K, PERTH); Smith's Mill, Jan 1903, *Morrison* s.n. (PERTH); Yarloop, Feb 1947, *Royce* 1471 (PERTH); Bushmead, Jan 1956, *Royce* 5207 (PERTH); Belmont, Nov 1925, *Steedman* 1166 (PERTH); Collie, Jun 1916, *Wakefield* 344 (PERTH).

***Distribution and habitat*:** *Stachystemon vermicularis* occurs from near Eneabba south to Collie in south-western Western Australia. It is recorded as growing on gentle undulating country in open forest or woodland dominated by *Eucalyptus marginata* and *Corymbia calophylla* usually on grey to yellow grey sandy soils sometimes with lateritic gravel in profile. **Map 18.**

***Phenology*:** Flowers have been collected throughout the year, fruits in September and from November to January.

***Notes*:** In the protologue of *Stachystemon vermicularis*, Planchon (1845) cited 'Prope Flumen Cygnorum, legit Drummond' for the material he studied. At the time Planchon was an assistant to W.J. Hooker at Kew. From the material on loan to us from K we have located a sheet which is stamped as originating from Hooker's herbarium. This sheet appears to have two separate Drummond collections mounted on it. The five stems on the left belong to one collection and is associated with the information "Swan River, N. Holland, Drummond" while the single stem on the right of the sheet is the other collection with the information "Swan River Drummond" associated with it. Both collections agree with the protologue description for the species. The specimen on the right closely matches the illustration in the protologue and is, therefore, selected here as lectotype for *Stachystemon vermicularis*.

8. Stachystemon vinosus Halford & R.J.F.Hend., **sp. nov.** distincta sed affinitatibus incertis. Ab speciebus *Stachystemonis* Planch. ceteris omnibus lamina foliorum anguste ovata vel anguste oblongo-elliptica et mucrone albido usque ad 0.4 mm longis ad apicem, et floribus masculinis tepalis externis majoribus et marroninis ad vinosis differt. **Typus:** Western Australia. c. 40 km N of mouth of Oldfield River, 21 Oct 1968, *Hj. Eichler* 20361 (holo: PERTH; iso: AD).

Stachystemon sp. Mt Baring (K.R.Newbey 9773); Robinson & Coates (1995), Paczkowska & Chapman (2000).

Compact shrub to 10 cm high; stems decumbent to erect, much-branched; branchlets, smooth, glabrous. Leaves evenly spaced along stems

and branchlets, alternate or decussate; stipules narrowly triangular, 0.8–1.5 mm long, 0.4 mm wide, glabrous, red-brown becoming grey-white coloured with age, attenuate, and with margins entire; decurrent margins papillose; petioles 0.5–0.9 mm long, smooth; laminae concavo-convex, narrowly ovate or narrowly oblong-elliptic, 6–10 mm long, 1.5–2 mm wide, minutely papillose and glabrous adaxially and abaxially; midrib obscure adaxially, prominent abaxially; tip straight or slightly recurved, acute with white-coloured mucro 0.1–0.4 mm long; margins flat, prominently thickened. Flowers solitary in axils of upper leaves, grouped into terminal clusters with some subtending leaves reduced and bract-like; bracts triangular, c. 1 mm long, with a few crisped hairs on adaxial surface, reddish brown coloured; bracteoles 1 or 2, similar to but smaller than bracts. Male flowers on stout pedicels c. 0.5 mm long, tepals 6, dissimilar, with inner whorl longer than outer whorl, erect, tumid; outer tepals 3, ovate, (1.2–)2.5–3 mm long, (0.8–)1.5–2 mm wide, with two of them maroon to purplish red coloured and one white, with tip obtuse or shortly acuminate and with margins irregularly toothed; inner tepals 3, linear to narrowly obovate, 6.5–7 mm long, 1–1.5 mm wide, purplish red coloured, with tip acute, and margins entire; receptacle hemispherical, c. 0.5 mm long, c. 1 mm diameter, glabrous; stamens 26–40, with filaments of uneven length, dorsi-ventrally flattened, 0.5–1 mm long, and anthers obloid, 0.4–0.6 mm long, papillose, dark purplish red coloured. Female flowers sessile; tepals (4 to) 6, ± similar, narrowly ovate, 1.5–2.5 mm long, 0.4–0.7 mm wide, white, slightly keeled, scarious, glabrous on both surfaces; apex acuminate; margins minutely irregularly toothed. Ovary 0.4–0.5 mm diameter; locules 2; styles c. 1.2 mm long, papillose proximally. Fruits sessile, ± ovoid though laterally compressed, c. 6.5 mm long, c. 3.2 mm wide, c. 2.7 mm across, smooth, glabrous. Seeds subglobose, c. 3.2 mm long, c. 2.7 mm across; exostome pit poorly developed; caruncle irregularly shaped, c. 1 mm long, c. 1 mm wide. **Fig. 6.**

***Additional specimens*: Western Australia.** 10 km NW of Mt Baring, *Newbey* 9773 (BRI); Bandalup Hill, 3.2 km S of Highway, Sep 1993, *Robinson* 1139 (PERTH); Mt Ragged, Nov 1976, *Wittwer* W1909 (PERTH).

***Distribution and habitat*:** *Stachystemon vinosus* is recorded from along the south coast of Western Australia from near the Oldfield River, Bandalup Hill, Mt Baring and Mt Ragged. It is recorded as growing on stony slopes, in rock crevices on breakaways and on well-drained fine loamy sand on sandplains in associated with *Eucalyptus tetraptera*. **Map 19.**

***Phenology*:** Flowers and fruits have been collected from September to November.

***Affinities*:** *Stachystemon vinosus* is a distinctive species though its exact affinities are uncertain. It is distinguished from other species of *Stachystemon* by its narrowly ovate or narrowly oblong-elliptic leaf laminae with a whitish coloured mucro up to 0.4 mm long at the apex, and the larger, ovate, maroon to purplish red coloured outer tepals in its male flowers.

***Etymology*:** The specific epithet is from the Latin *vinosus*, meaning 'wine-coloured' or 'purplish red', a reference to the colour of the perianth of male flowers in this species.

***Notes*:** The conservation status of *Stachystemon vinosus* (as *Stachystemon* sp. Mt Baring (K.R.Newbey 9773) is given as Priority 1 (Westerrn Australian Herbarium 1998-2003) under the Western Australian Flora Conservation Codes.

9. Stachystemon virgatus (Klotzsch) Halford & R.J.F.Hend., **comb. nov.**

Chrysostemon virgatus Klotzsch in Lehm., Pl. Preiss. 2: 232 (1848); *Pseudanthus virgatus* (Klotzsch) Müll.Arg., Linnaea 34: 56 (1865). **Type:** [Western Australia.] In limoso-lapidosis planitiei montis, Bakewell (York), 12 September 1830, *L. Preiss* 1230 (holo: LD [LD99/018–0880]; iso: B (ex Herb. L.C. Treviranus), G-DC *n.v.*, microfiche IDC 800–73. 2454: I. 3 (bottom right element), MEL [MEL2062935]).

Pseudanthus occidentalis F.Muell., Fragm. 1: 107/108 (1859). **Type:** [Western Australia.] Fitzgerald and Gardner [Rivers], [without date and collector; *G. Maxwell*?] (holo: MEL [MEL2066092]).

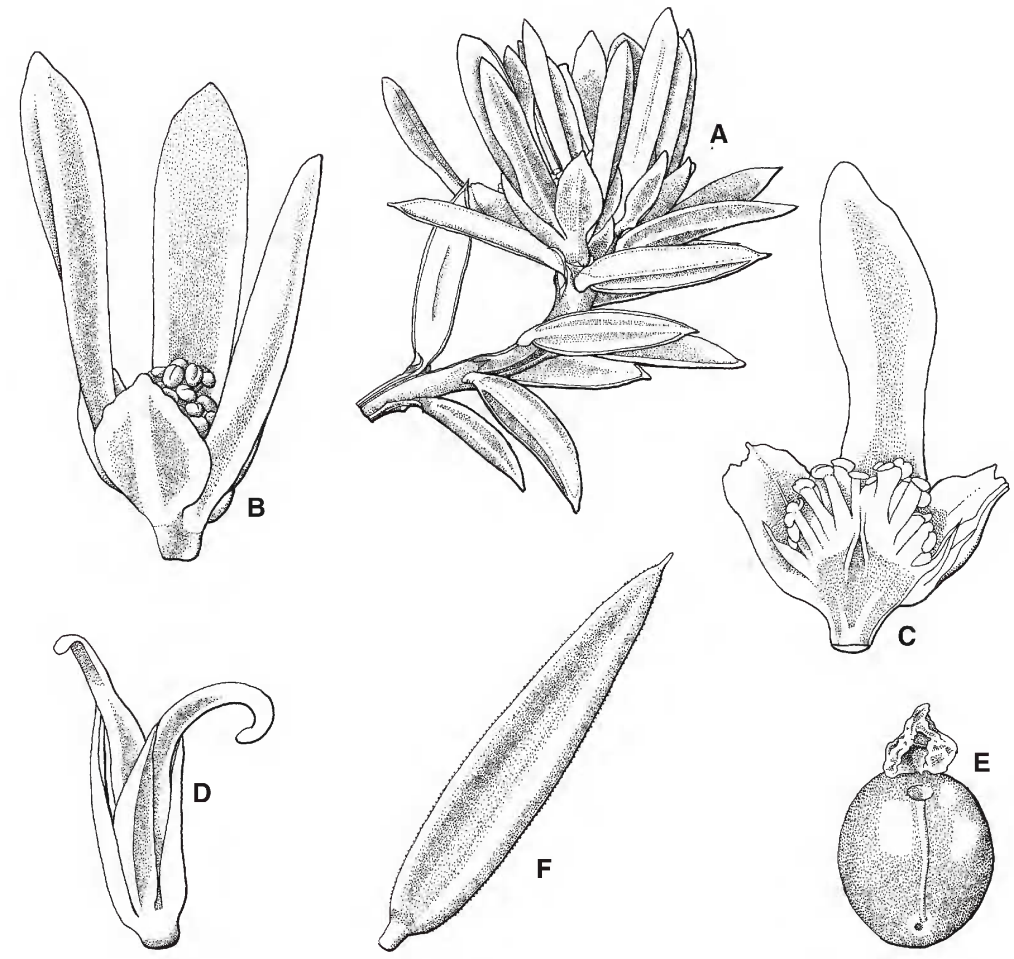


Fig. 6. ***Stachystemon vinosus***. A. branchlet with flowers × 4. B. male flower from side × 8. C. longitudinal section of male flower × 8. D. female flower × 12. E. seed × 8. F. leaf × 6. A, B from *Robinson* 1139 (PERTH); C, E, F from *Wittwer* 1909 (PERTH); D from *Eichler* 20361 (PERTH). Del. W. Smith.

Chorizotheca micrantheoides Müll.Arg., Linnaea 32: 76 (1863). **Type:** [Western Australia.] Swan River, [without date,] [*J.*] *Drummond* s.n. (holo: G-DC *n.v.*, microfiche IDC 800–73. 2454: I. 3 (top left element)).

Pseudanthus nitidus Müll.Arg. in A. DC., Prodr. 15(2): 197/8 (1866). **Type:** [Western Australia.] King George's Sound, [without date,] *Cuming* s.n. (holo: G-DC *n.v.*, microfiche IDC 800–73. 2454: I. 5).

Compact shrub to 40 cm high; stems ascending or erect, much-branched; branchlets smooth, with scattered spreading unicellular hairs up to 0.8 mm long. Leaves evenly spaced along stems and branchlets, decussate or sometimes alternate; stipules subulate, somewhat setaceous, 0.9–1.6 mm long, 0.2–0.3 mm wide, glabrous or with a few hispid hairs on margins and abaxial surface, pubescent adaxially, pale red becoming grey coloured with age, attenuate with a dark brown gland at tip, and with margins entire; decurrent margins hispidulous; petioles 0.4–0.8 mm long, smooth or papillose; laminae slightly concavo-convex, elliptic, narrowly oblong-elliptic or rarely orbicular, 1.9–9.7 mm long, 1.3–3.1 mm wide, smooth adaxially and abaxially, glabrous or with scattered hispidulous hairs adaxially and abaxially; midrib obscure adaxially, slightly prominent abaxially; tip straight or slightly recurved, rounded to obtuse sometimes with a minute brown-coloured apiculum; margins flat, thickened but not obviously so. Flowers solitary in axils of upper leaves with subtending leaves rarely reduced and bract-like; bracts narrowly triangular, 0.2–0.4 mm long, glabrous, reddish brown coloured; bracteoles absent or up to 2, when present similar to but smaller than bracts. Male flowers on slender pedicels 1.5–3 mm long; tepals (3 or) 4, morphologically ± similar, convex, ovate, 1.1–1.8 mm long, 0.8–1.1 mm wide, somewhat tumid, yellow coloured sometimes with a reddish blush distally, with apex acute, and margins irregularly toothed; receptacle slightly convex, c. 0.2 mm long, c. 0.5 mm diameter, glabrous; stamens (7–)10–14, with filaments of uneven length, terete, 0.2–1 mm long, and anthers ellipsoid, 0.3–0.4 mm long, ± smooth, yellow coloured. Female flowers sessile or pedicellate on slender pedicels up to 0.8 mm long; tepals 4 (or 5), morphologically similar, narrowly ovate to ovate, 1–1.8 mm long, 0.3–0.6 mm wide, greenish yellow coloured with a reddish flush distally, keeled, scarious, with scattered spreading hairs up to 0.1 mm long on abaxial surface, glabrous on adaxial surface; apex acute; margins irregularly toothed. Ovary 0.4–0.5 mm diameter; locules 2; styles 1.4–1.5 mm long, glabrous. Fruits sessile or on pedicel up to 0.5 mm long, ellipsoidal or ovoid but laterally compressed, 5.4–6 mm long, 3.2–4.5 mm wide, 2.6–3 mm across, ± smooth, with scattered minute spreading hairs up to 0.3 mm long. Seeds obloid, 3.5–3.8 mm long, 1.9–2.5 mm wide, 1.9–2 mm across; exostome pit well developed; caruncle subconical, c. 0.7 mm long, 0.8–0.9 mm wide.

***Selected specimens (from c. 55 examined)*: Western Australia.** between Ravensthorpe and Esperance, between 395 and 396 mile pegs from Perth, Nov 1968, *Canning* WA/68 7150 (CANB); Gibson's Soak, between Norseman and Esperance, Sep 1934, *Gardner* s.n. (PERTH); between Toodyay and Bindoon, Oct 1947, *Gardner* 8718 (PERTH); Oldfield River, Oct 1960, *Gardner* s.n. (PERTH); Cape Riche, Oct 1942, *Gardner* 6536 (PERTH); West Mt Barren, Oct 1965, *George* 6964 (PERTH); SW side of Mt Desmond, c. 10 km ESE of Ravensthorpe, Sep 1988, *Henderson* H3190 (BRI); between Esperance and Munglinup, c. 7 km W of Lort River crossing, Sep 1988, *Henderson* H3183 (BRI); c. 40 km from Jerramungup on road to Ravensthorpe, Sep 1988, *Henderson* H3193 (BRI); W of Munglinup, Sep 1976, *Hnatiuk* 761265 (PERTH); between Lort River and Munglinup, Sep 1976, *Hnatiuk* 761268 (PERTH); Kojaneerup Springs, eastern Stirling Range, Oct 1982, *Keighery* 5722 (PERTH); northern foot of Bluff Knoll, Stirling Ranges, Sep 1966, *Muir* 3867 (MEL); Capel, Sep 1951, *Royce* 3787 (PERTH); Abba River, Sep 1951, *Royce* 3803 (PERTH); Cut Hill, York, Sep 1923, *Sargent* s.n. (PERTH); 80 miles [c. 129 km] ENE of Esperance, Sep 1965, *Turner* 5549F (PERTH); c. 67 km E of Esperance, near Mungliginup Creek, Sep 1968, *Wilson* 8077 (PERTH); Stirling Range, 1 km N of base of Bluff Knoll, Sep 1966, *Wilson* 4188 (PERTH); 10 miles [c. 16 km] from Red Gum Pass - Kendenup road, along Stirling Range Drive, Stirling Range NP, Oct 1968, *Wrigley* WA/68 4378 (CANB).

***Distribution and habitat*:** *Stachystemon virgatus* occurs in coastal and subcoastal districts of south-western Western Australia, from the Stirling Ranges eastward to Esperance, with disjunct populations between Bunbury and Busselton, and near York. It is recorded as growing on gentle slopes in mallee heath on lateritic gravelly brown loam or stony sandy clay, or in eucalypt woodland on brown sandy loam, on sandplain in heathland on sand or sandy loam with considerable gravel intermixed, in open forest dominated by *Eucalyptus marginata* and *Corymbia calophylla* on rocky lateritic soils; also recorded on a rocky knoll in crevices of quartzite rock and in swampy areas. **Map 20.**

***Phenology*:** Flowers and fruits have been collected from September to November.

***Notes*:** *Stachystemon virgatus* is the only species of *Stachystemon* that has a hispidulous indumentum of unicellular hairs up to 0.8 mm long on its branchlets. All other species of *Stachystemon* have glabrous branchlets.

Acknowledgements

We would like to thank Dr Gordon Guymer for making space and facilities available at BRI for the first author; the directors and curators of AD, B, CANB, K, LD, MEL, NE, NSW, PERTH for loan of their holdings for study at BRI, Alex Chapman for searching for types on our behalf at E while acting as Australian Botanical Liaison Officer at K and Peter Bostock (BRI) for preparing the maps. Associated fieldwork from 1988 to 1992 by the second author and salary support for the first author in 1999 and 2000 were funded by grants from the Australian Biological Resources Study (ABRS), Department of Environment and Heritage, which are gratefully acknowledged.

References

Baines, J.A. (1981). *Australian Plant Genera.* Chipping Norton, New South Wales: Surrey Beatty & Sons for Society for Growing Australian Plants.

Bentham, G. (1873). Euphorbiaceae. *Flora Australiensis* 6: 41–153. London: L.Reeve.

Bentham, G. (1880). Euphorbiaceae. In G. Bentham & J.D. Hooker, *Genera Plantarum* 3: 239–340.

Corrick, M.G. & Fuhrer, B.A. (1996). *Wildflowers of southern Western Australia.* Noble Park, Victoria: The Five Mile Press Pty Ltd in association with Monash University.

Corrick, M.G. & Fuhrer, B.A. (2000). *Wildflowers of Victoria and adjoining areas.* Hawthorn, Victoria: Blooming Books.

Dallwitz, M.J., Paine, T.A. & Zurcher, E.J. (1993). *DELTA user's guide, a general system for processing taxonomic descriptions,* 4th edn. East Melbourne: CSIRO.

Forster, P.I. & Halford, D.A. (2002). Euphorbiaceae. In R.J.F. Henderson (ed.), *Names and Distribution of Queensland Plants, Algae and Lichens*, 68–74. Brisbane: Environmental Protection Agency.

George, A.S. (1968, '1967'). 12.-Additions to the flora of Western Australia: ten miscellaneous new species. *Journal of the Royal Society of Western Australia* 50(4): 97–100.

Grüning, G. (1913). IV. 147 Euphorbiaceae - Porantheroideae et Ricinocarpoideae. In A. Engler (ed.), *Das Pflanzenreich, Regni vegetabilis conspectus* H.58: 1–97. (1968 facsimile-H.R. Engelmann (J. Cramer): Weinheim/Bergstrasse.).

Hayden, W.J. (1994). Systematic anatomy of Euphorbiaceae subfamily Oldfieldioideae. I. Overview. *Annals of the Missouri Botanical Garden* 81: 180–202.

Holmgren, P.K., Holmgren, N.H. & Barnett, L.C. (1990). *Index Herbariorum. Part1. The Herbaria of the World,* 8th edn. New York: New York Botanic Gardens.

Hopper, S.D., van Leeuwen, S. Brown, A.P. & Patrick, S.J. (1990). *Western Australia's endangered flora and other plants under consideration for declaration.* Wanneroo: Department of Conservation and Land Management.

Jeanes, J.A. (1999). Euphorbiaceae. In N.G. Walsh & T.J. Entwisle (eds), *Flora of Victoria* 4: 55–82. Melbourne: Inkata Press.

Levin, G.A. & Simpson, M.G. (1994). Phylogenetic implications of pollen ultrastructure in the Oldfieldioideae (Euphorbiaceae). *Annals of the Missouri Botanical Garden* 81: 203–238.

Mueller, F. (1858). Account of some new Australian plants. *Transactions and Proceedings of the Philosophical Institute of Victoria* 2: 62–77.

Mueller, F. (1860). *Fragmenta Phytographiae Australiae* 2: 14. Melbourne: Victorian Government.

Mueller, F. (1861). *Fragmenta Phytographiae Australiae* 2: 153. Melbourne: Victorian Government.

Müller, J. (1866). Euphorbiaceae. In A.L.P.P. de Candolle (ed.), *Prodromus Systematis Naturalis Regni Vegetabilis.* 15(2): 189–214.

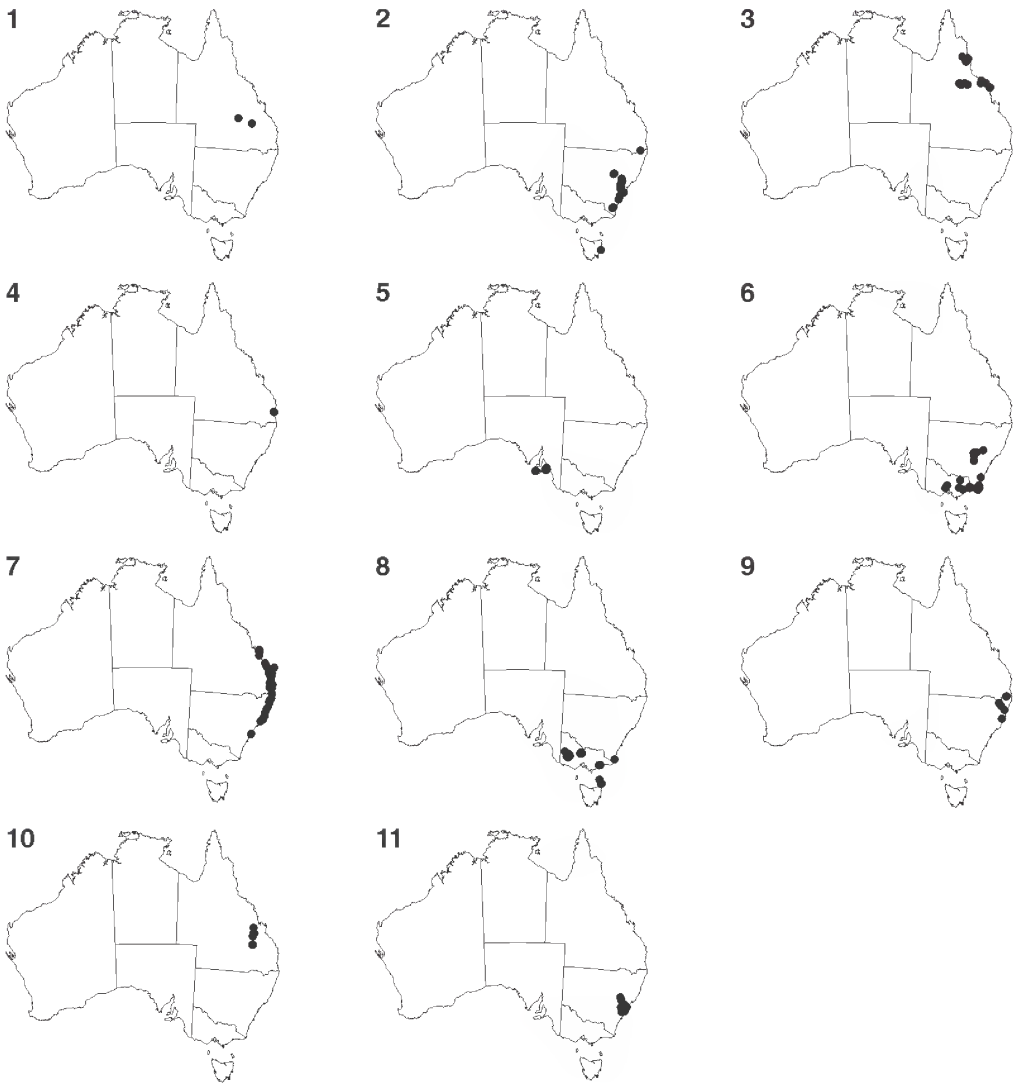
Paczkowska, G. & Chapman, A.R. (2000). *The Western Australia flora: a descriptive catalogue.* Perth: Wildflower Society of Western Australia (Inc.), the Western Australia Herbarium, CALM and the Botanic Garden and Parks Authority.

Pax, F. & Hoffmann, K. (1931). Euphorbiaceae. In A. Engler & K. Prantl (eds), *Die Natürlichen Pflanzenfamilien,* 2nd edn, 19c: 11–233.

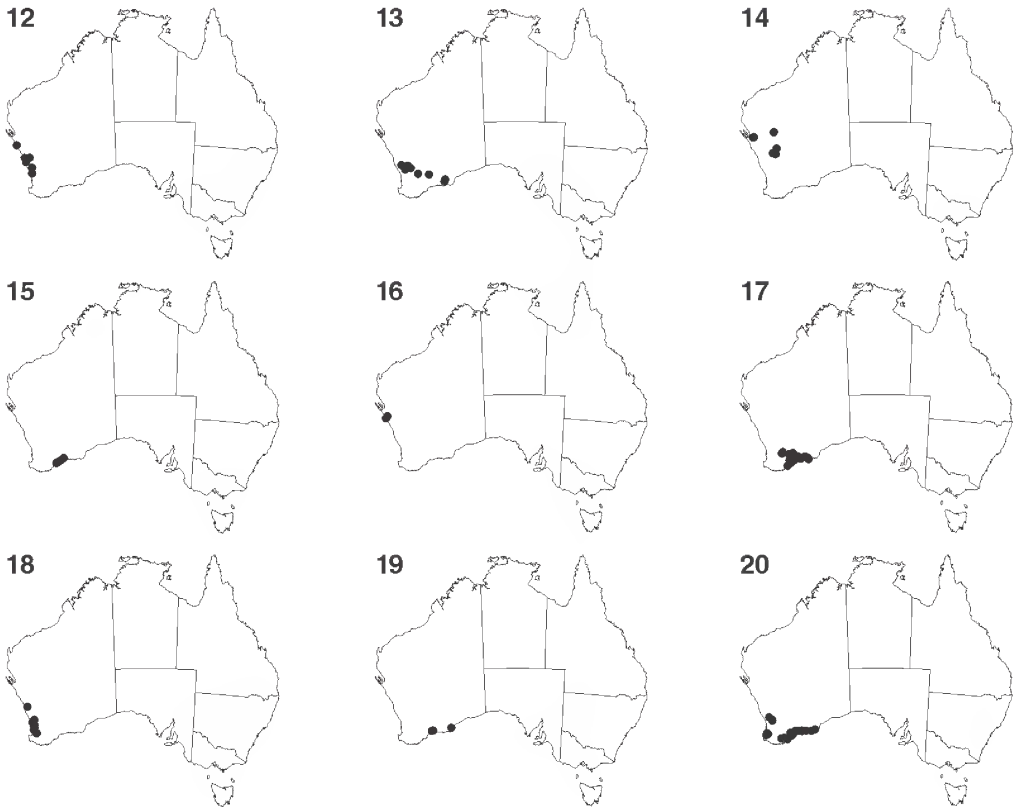
Planchon, J.E. (1845). Description de deux genres nouveaux de la famille Euphorbiacées. *London Journal of Botany.* 4: 471.

Radcliffe-Smith, A. (1993). Notes on Australian Euphorbiaceae II: *Pseudanthus* and *Stachystemon*. *Kew Bulletin* 48(1): 165–168.

Robinson, C.J. & Coates, D.J. (1995). *Declared rare and poorly known flora in the Albany district.* Wildlife Management Program No. 20. Como: Department of Conservation and Land Management, Western Australia.



Maps 1–11. Distribution of *Pseudanthus* taxa. **1.** *Pseudanthus ballingalliae* **2.** *Pseudanthus divaricatissimus* **3.** *Pseudanthus ligulatus* subsp. *ligulatus* **4.** *Pseudanthus ligulatus* subsp. *volcanicus* **5.** *Pseudanthus micranthus* **6.** *Pseudanthus orbicularis* **7.** *Pseudanthus orientalis* **8.** *Pseudanthus ovalifolius* **9.** *Pseudanthus pauciflorus* subsp. *pauciflorus* **10.** *Pseudanthus pauciflorus* subsp. *arenicola* **11.** *Pseudanthus pimeleoides*



Maps12–20. Distribution of *Stachystemon* species. **12.** *Stachystemon axillaris* **13.** *Stachystemon brachyphyllus* **14.** *Stachystemon intricatus* **15.** *Stachystemon mucronatus* **16.** *Stachystemon nematophorus* **17.** *Stachystemon polyandrus* **18.** *Stachystemon vermicularis* **19.** *Stachystemon vinosus* **20.** *Stachystemon virgatus*

SPRENGEL, K.P.J. (1827). *Systema vegetabilium*, 16th edn, 4(2) *curae posteriores*: 22, 25. Gottingae: Dietrich.

STAFLEU, F.A. & COWAN, R.S. (1985). *Taxonomic Literature*, 2nd edn, Vol. 5. Utrecht, Bohn: Schetema & Bolkema.

WALSH, N.G. (1996). Polygonaceae. In N.G. Walsh & T.J. Entwisle (eds), *Flora of Victoria* 3: 282. Melbourne: Inkata Press.

WEBER, J.Z. & MORLEY, D.J. (1985). Plant Portraits. *Journal of the Adelaide Botanic Gardens* 7: 212–215.

WEBER, J.Z. (1986). Euphorbiaceae. In J.P. Jessop & H.R. Toelken (eds), *Flora of South Australia*, 4th edn, 2: 735–768. Adelaide: South Australian Government Printing Division.

WEBSTER, G.L. (1994). Synopsis of the genera and suprageneric taxa of Euphorbiaceae. *Annals of the Missouri Botanical Garden* 81: 33–144.

Western Australian Herbarium (1998–2003). *Flora Base – The Western Australian Flora*. Version 2.0, 4 July 2003. Department of Conservation and Land Management. http://florabase.calm.wa.gov.au

Index to Scientific Names

Names in **bold type** are accepted names and those in light are synonyms, etc. The numbers refer to pages in the text.